MARINE MAMMAL OBSERVATION
AND
HYDROACOUSTIC MONITORING PLAN

FOR YEAR #1- THE BULKHEAD REPAIRS S45N AT NAVAL STATION NEWPORT

IN NEWPORT, RHODE ISLAND

Doyon Project Services

Fathom Resources, LLC

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Abbreviations and Acronyms

µPa	microPascal(s)
re 1 µPa	Referenced to a pressure of 1 microPascal
dB	Decibel(s)
GPS	Global positioning system
Hr	Hour
Hz	Hertz
LOA	Letter of Authorization
NA	Not applicable
NAVFAC	Naval Facilities Engineering Systems Command
NAVSTA	Naval Station
NMFS	National Marine Fisheries Service
NRM	Natural Resource Manager
OPR	Office of Protected Resources
PSO	Protected Species Observer
PTS	Permanent threshold shift
Sec	Second(s)
SEL	Sound exposure level
SF	Square feet
SPL	Sound pressure level
SSV	Sound source verification
TTS	Temporary threshold shift
ZOI	Zone of Influence

Chapter 1. Introduction

1.1 Purpose of the Marine Mammal and Hydroacoustic Monitoring Plan

The purpose of this Marine Mammal and Hydroacoustic Monitoring Plan (Plan) is to detail the protocols for marine mammal and hydroacoustic monitoring activities associated with the Bulkhead repairs, S45N at Naval Station Newport, Rhode Island (Attachment 1). In accordance with the Marine Mammal Protection Act (MMPA) of 1972, as amended, an application for Letter of Authorization (LOA)] was submitted to National Marine Fisheries Service (NMFS) in June 2020. Incidental take of Atlantic White-sided Dolphin (Lagenorhynchus acutus), Common Dolphin (Delphinus delphis), Harbor Porpoise (Phocoena phocoena), Harbor Seal (Phoca vitulina), Gray Seal (Halichoerus grypus), Harp Seal (Pagophilus groenlandicus), and Hooded Seal (Cystophora cristata) are anticipated as a result of the proposed project (Attachment 2- LOA)

This phase of the project includes replacement of bulkhead S45N at Naval Station Newport. Sections of deteriorating, unstable and eroding bulkhead, sheet pile and revetment will be replaced or repaired along Coddington Cove waterfront of Naval Station (NAVSTA) Newport in Newport, Rhode Island. Construction will include the use of vibratory hammers to install sheet, pipe and H-piles within Bulkhead S45N section. In order to properly install new bulkheads and revetments limited dredging will occur along the shoreline.

The purpose of monitoring is:

1. To minimize the potential for Level A (injury) harassment of marine mammals by implementing shutdown zones whenever a marine mammal is within a distance as specified by the application and subsequent authorization;
2. To determine the numbers and species of marine mammals that occur within established Level A (injury) and Level B (behavioral) harassment zones, and to document any differences in species, numbers, or effects relative to Project-related in-water activities; and
3. To empirically measure sound source levels for different types of piles and installation/removal methods, as detailed in the application and subsequent authorization.

1.2 Summary of Activities to be Monitored for Marine Mammals

All relevant in-water construction and demolition activities that have the potential to result in Level A and Level B harassment of marine mammals, including installation of sheet, pipe and H piles via vibratory pile driving, will be monitored. In addition, Down-the-hole hammer may be used if obstruction is encountered. No impact drilling is to be performed.

In-water construction and demolition activities under this Plan must comply with all mitigation and minimization measures as detailed in Chapter 11 and Chapter 13 of the application (Attachment 1) and subsequent authorization.

In-water activities expected to result in incidental takes of marine mammals would occur during approximately six months of the project phase, beginning in December 2022 through May 2023. The estimated duration of noise generating activities is provided in Table 1 (Estimated duration of noise generating activities). Estimated numbers of species takes are included in the Application Attachment 1 of this Plan and Table 2 (Total underwater exposure estimates by species). A request to amend the authorization for additional construction methods, including DTH activities and vibratory driving of steel pipe piles, was submitted to NMFS on 15 November. The Navy is currently waiting for NMFS to conduct

the review of the amendment request. Work on previously authorized activities will commence on schedule but the new activities will not begin until the amended authorization is received.

Table 1: Estimated Duration of Sound Generating Activities

Action & Project Section	**Estimated Construction Start Date**	**Estimated Construction End Date**
Repair Bulkhead & Associated Stormwater/Outfall Infrastructure, Section S45 North Sheet Pile	12/12/2022	5/31/2023

Table 2: Total Underwater Exposure Estimates by Species

Year	**Species**	**Level A (PTS Onset)**	**Level B (Behavioral)**	**Total Authorized Take**
1	Atlantic white-sided dolphin	0	16	16
	Short-beaked common dolphin	0	28	28
	Harbor Porpoise	1	4	5
	Harbor Seal	15	188	203
	Gray Seal	3	100	103
	Harp Seal	1	16	17
	Hooded Seal	0	5	5[1]

[1] To guard against unauthorized take, the Navy is requesting 1 Level B (behavioral) take of hooded seal per month of construction when this species may occur (Jan through May) for each construction year.

1.3 Mitigation Measures

The following mitigation measures, as specified in the submitted application and anticipated authorization, shall be implemented during in-water noise generating activities to minimize Level A and Level B harassment.

1. The Holder must employ PSOs and establish monitoring locations as described in section 5 of the LOA and in this Marine Mammal Monitoring Plan. The Holder must monitor the project area to the maximum extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions.

2. Monitoring must take place from 30 minutes prior to initiation of pile driving activity *(i.e.,* pre-start clearance monitoring) through 30 minutes post-completion of pile driving activity.

3. If a marine mammal is observed entering or within the shutdown zones indicated in Table 2, pile driving activity must be delayed or halted. Pile driving must be commenced or resumed as described in condition 4(g) of the LOA.

4. The Holder must establish shutdown zones for all pile driving activities (Table 2 of LOA).

Shutdown zones are limited to 150 m from the point of noise generation. Any remaining area within estimated Level A harassment zones shall be considered part of the "disturbance zone," i.e., the Level B harassment zone and, where present, the Level A harassment zone (PTS onset) beyond 150 m from the point of noise generation. For activities where the estimated Level A (PTS onset) harassment zones are smaller than 150 m, the disturbance zone shall include the entire region of influence (ROI), i.e., estimated Level A and Level B harassment zones). Work may proceed without cessation while marine mammals are in the disturbance zone and marine mammal behavior within the disturbance zone shall be monitored and documented.

5. The Navy will conduct monitoring to include the area within the Level B harassment zones (areas where SPLs are equal to or exceed the 120 dB rms threshold during vibratory pile driving) (see Disturbance Zones in Table 2 of LOA).

6. Pre-start clearance monitoring must be conducted during periods of visibility sufficient for the lead PSO to determine that the shutdown zones indicated in Table 2 of the LOA are clear of marine mammals. Pile driving may commence following 30 minutes of observation when the determination is made that the shutdown zones are clear of marine mammals.

7. If pile driving is delayed or halted due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily exited and been visually confirmed beyond the shutdown zone indicated in Table 2 of the LOA or 15 minutes have passed without re-detection of the animal.

8. The Holder must use soft start techniques when impact driving. Soft start requires contractors to provide an initial set of three strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced-energy strike sets. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer.

9. Pile driving activity must be halted (as described in condition 4(c) of LOA) upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the harassment zone (as shown in Table 2 of LOA).

10. The Holder, construction supervisors and crews, PSOs, and relevant Navy staff must avoid direct physical interaction with marine mammals during construction activity. If a marine mammal comes within 10 meters of such activity, operations must cease and vessels must reduce speed to the minimum level required to maintain steerage and safe working conditions, as necessary to avoid direct physical interaction.

11. Should environmental conditions deteriorate such that marine mammals within the entire

shutdown zone would not be visible *(e.g.,* fog, heavy rain, night), the Holder shall delay pile driving and removal until observers are confident marine mammals within the shutdown zone could be detected.

Chapter 2. Monitoring Zones

2.1 Level A and Level B Harassment Monitoring Shutdown Zones

For all vibratory pile driving, Level A (PTS onset) and Level B (behavioral) harassment zones will be visually monitored with implementation of shutdown zones to avoid injury. To prevent injury from physical interaction with construction equipment, a shutdown zone of 33 ft or 10 meters will be implemented during all in-water construction activities having the potential to affect marine mammals to ensure marine mammals are not present within this zone. For some sound-generating activities, the potential for Level A (PTS onset) harassment by acoustic injury extends less than 10 m from the source, and for these activities, the shutdown zone automatically mitigates/minimizes Level A (PTS onset) harassment. Level A and Level B harassment monitoring zones are shown in Figure 1 and Figure 2. These zones are based on maximum potential distances as shown in Table 3 (Shutdown zone distances by activity).

Vibratory drilling of 30" steel pipe piles and Obstruction drilling, down-the-hole hammer were not included in the original application.

Table 3: Shutdown Zone Distances by Activity, Year #1

Pile Type, Size, and Driving Method	Shutdown Zone		Disturbance Zone
	Cetaceans	Seals	
Vibratory drive 22.5-inch, Z-shaped sheet Piles	30 meters	10 meters	ROI
Vibratory driving of 14" H-piles	10 meters	10 meters	ROI
Vibratory drive 30 inch steel pipe pile	30 meters	10 meters	3,981 meters
Obstruction drilling, down-the-hole hammer	150 meters[1]	150 meters[1]	ROI

1. Monitoring zone distance previously negotiated with NMFS on this project
2. Impact pile driving will not be performed as part of this project, as previously authorized

Figure 1. Level A Injury (PTS Onset) and Level B (Behavioral) Harassment Zones from Vibratory Driving 30-inch Steel Pipe Piles

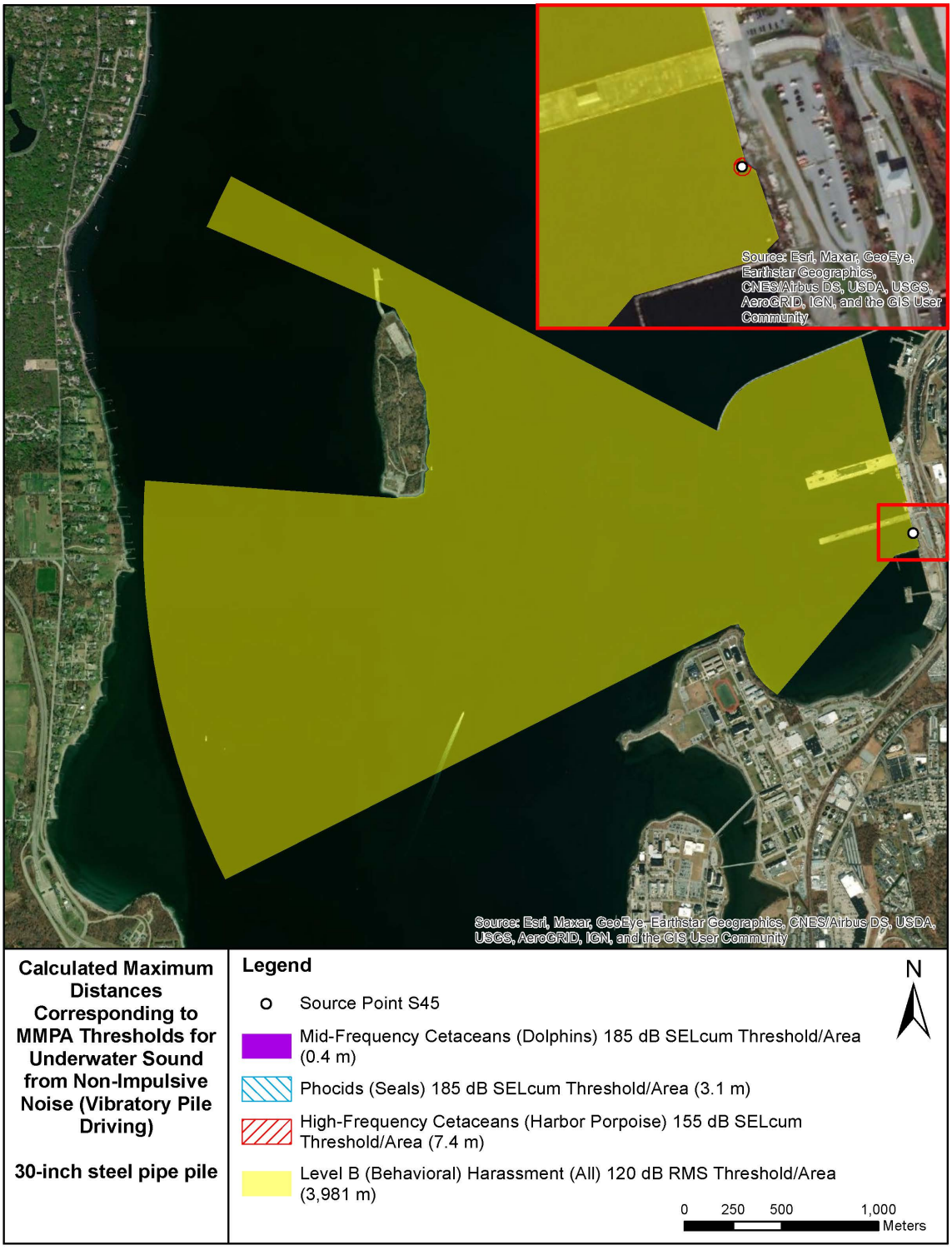
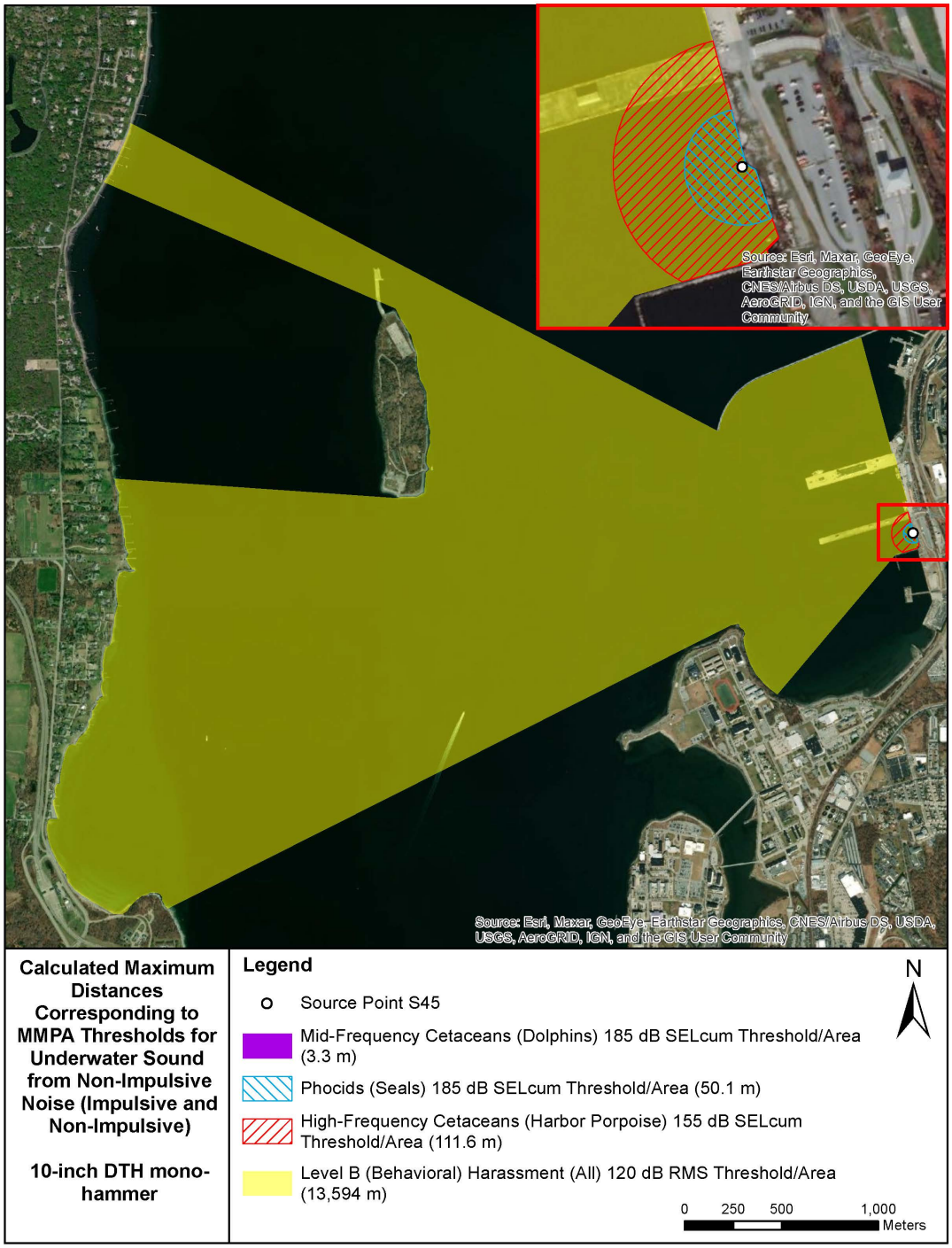


Figure 2. Level A Injury (PTS Onset) and Level B (Behavioral) Harassment Zones from 10-inch DTH Mono-Hammer



2.2 Observer Monitoring Locations

In order to effectively monitor the Level A and Level B harassment zones, protected species observers (PSOs) will be positioned at the best practicable vantage points, taking into consideration security, safety, and space limitations. The Fathom PSO team will consist of three PSOs with at least two PSOs completing visual monitoring protocols at one time. The number of PSOs will be increased if needed based on scope of work. The PSO team will include one Lead PSO and two PSO's. Noted PSO vantage point locations are show on Figure 3. (PSO Vantage Points). PSO vantage point locations include Gould Island Pier, Gould Island South, Breakwater, Coddington Point, Bishop Rock, Taylor Point Lookout, and Coasters Harbor Island.

Figure 3- PSO Vantage Points

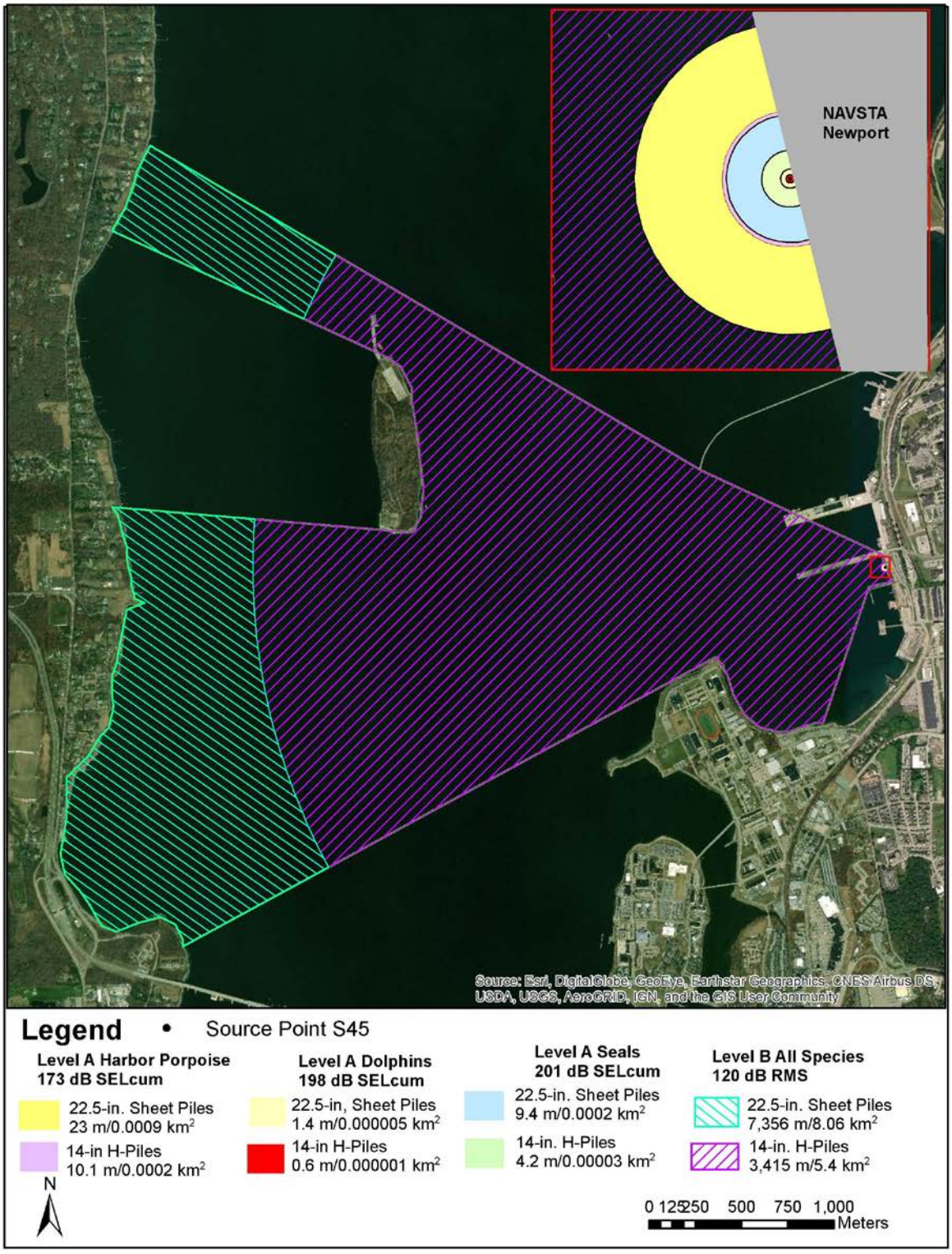


Figure 4. Predicted Distances to Regulatory Noise Thresholds for Marine Mammals During Vibratory Pile Driving – Section S45

Chapter 3. Visual Monitoring Protocols

The visual monitoring components of this Plan take into consideration the logistical, environmental, and security requirements for working in the project area. The distances to the Level A and Level B harassment boundaries were used to determine monitoring locations for the activities associated with this Plan.

3.1 Protected Species Observer Qualifications

Monitoring must be conducted by qualified PSOs, in accordance with the following conditions:

- PSOs must be independent (i.e., not construction personnel) and have no other assigned tasks during monitoring periods.
- At least one PSO must have prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization.
- Other PSOs may substitute other relevant experience, education (degree in biological science or related field), or training for prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization.
- Where a team of three or more PSOs is required, a lead observer or monitoring coordinator must be designated. The lead observer must have prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization.
- PSOs must be approved by NMFS prior to beginning any activity subject to this LOA.

For all pile driving activities, a minimum of one PSO must be assigned to each active pile driving location to monitor the shutdown zones. Trained PSOs will be placed at the best vantage point(s) practicable such as on nearby breakwaters, Gould Island, Coddington Point, or Taylor Point. Visual monitoring will be conducted by, at a minimum, by two PSOs. It is assumed that two to three PSOs would be sufficient to monitor the respective ROIs given the abundance of suitable vantage points. Any activity that would result in threshold exceedance at or more than 1,000 m would require a minimum of three PSOs to effectively monitor the entire ROI. However, additional monitors may be added if warranted by site conditions and/or the level of marine mammal activity in the area.

PSOs must record all observations of marine mammals, regardless of distance from the pile being driven, as well as the additional data indicated in Section 6 of the LOA.

Additional qualifications and protocols of PSOs include the following:

- Will have the ability to conduct field observations and collect data according to the assigned protocol.
- Where a team of three or more PSOs is required, a lead observer or monitoring coordinator must be designated. The lead observer must have prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization.
- All credentials for assigned PSOs will be submitted to the Navy and NMFS for approval

- All PSOs working on this project will attend a training brief completed by Naval Station National Resources to include:
    - ZOIs that must be monitored and locations where PSOs must be stationed
    - Species for takes have been authorized
    - Monitoring and data collection protocols
    - Reporting protocols to ensure take limit is not exceeded
    - Reporting protocols to NMFS in accordance with the issued authorization
- Will have experience or training in the field identification of marine mammals, including the identification of behaviors
- Will have visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance. Use of binoculars may be necessary to correctly identify the target.
- Will have sufficient training, orientation, or experience with the construction operation to provide for personal safety during observation periods.
- Will have writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed, dates and times when in-water construction activities were conducted, dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined zone, and marine mammal behavior.
- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

3.2 Visual Monitoring

PSOs will be responsible for monitoring the shutdown zones, the disturbance zones and the pre-clearance zones, as well as effectively documenting Level A and B harassment take. The PSOs will monitor for marine mammals during all in-water pile activities associated with the project. The Navy will monitor the project area to the extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions. Visual monitoring will be conducted by, at a minimum by two PSOs. It is assumed that two to three PSOs would be sufficient to monitor the respective ROIs given the abundance of suitable vantage points. Any activity that would result in threshold exceedance at or more than 1,000 m would require a minimum of three PSOs to effectively monitor the entire ROI. However, additional monitors may be added if warranted by site conditions and/or the level of marine mammal activity in the area. Trained PSOs will be placed at the best vantage point(s) practicable such as on nearby breakwaters, Gould Island, Coddington Point, or Taylor Point (see Figure 2) to monitor for marine mammals and implement shutdown/delay procedures when applicable. The PSOs must record all observations of marine mammals, regardless of distance from the pile being driven

In addition, PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hr break between shifts and will not perform duties as a PSO for more than 12 hours in a 24-hr period (to reduce PSO fatigue).

3.2.1 Equipment

The following equipment will be required to conduct visual monitoring:

- Laser rangefinders used to measure distances to known objects as reference points for distances to marine mammals observed in the water
- Portable marine radios for the observers to communicated with the lead PSO, construction contractor and other observers

- Hearing protection for all personnel near the sound source. Depending on observer locations relative to the sound source, and the subsequent airborne source levels, a noise-reducing headset with capabilities to connect to a radio may be used
- Cellular phones (one per PSO location), and the contact information for the lead observer, other observers, and construction contractor
- Nautical charts
- Daily tide table for the project area
- Watch or chronometer
- Standard handheld binoculars and, if needed, high magnification binoculars
- Monitoring plan, LOA, and/or other relevant permit requirement specifications in sealed transparent plastic cover
- Data collection sheets with plastic cover (waterproof paper recommended)
- Marine mammal identification guides (waterproof paper recommended)
- Clipboard
- Pen/Pencil (capable of writing in rain)
- Elevated platform(s)

3.3 Visual Monitoring Methods

Prior to the start of all in-water noise generating activities, briefings will be conducted between the Navy, the construction contractor, and the PSO team. Briefings shall be conducted any time new personnel join the work. These briefings will explain responsibilities, communication procedures, visual monitoring protocols, and operational procedures. All PSOs will attend the training brief described above in Section 3.1.

The PSOs are tasked with collecting marine mammal sighting data, including behaviors noted for pre-, during-, and post-pile driving periods. All observations of marine mammals will be logged, with locations within the Level A or Level B harassment zone or shutdown zone noted. An assessment of take will occur if an animal or group of animals enters any of the Level A or Level B harassment zone during project-related activities. The efficacy of visual detection depends on factors such as the PSOs ability to detect the animal, the environmental conditions (visibility and sea state), and monitoring platforms. Pre-, during-, and post- noise generating activity visual survey protocols are described below.

PSOs will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for a shutdown to the pile driver operator. During all observation periods, observers will use binoculars and the naked eye to search continuously for marine mammals. Monitoring distances will be measured with range finders. Distances to animals will be based on the best estimate of the PSO, relative to known distances to objects in the vicinity of the PSO. Bearing to animals will be determined using a compass.

3.3.1 Visual Survey Protocols

The following survey protocols will be implemented prior to the start of noise generating activities:

3.3.1.1 Pre-Activity Monitoring

Monitoring must take place from 30 minutes prior to initiation of pile driving activity *(i.e.,* pre-start clearance monitoring). The Level A (PTS onset) shutdown and Level B (behavioral) disturbance zones will be monitored for 30 minutes prior to in-water construction/demolition activities. If a marine mammal is

present within the Level A shutdown zone, the activity will be delayed until the animal(s) leave the Level A shutdown zone. Activity will resume only after the PSO has determined that, through sighting or by waiting approximately 30 minutes, the animal has moved outside the Level A shutdown zone. Pre-start clearance monitoring must be conducted during periods of visibility sufficient for the lead PSO to determine that the shutdown zones are clear of marine mammals. Pile driving may commence following 30 minutes of observation when the determination is made that the shutdown zones are clear of marine mammals. PSOs must record all observations of marine mammals, regardless of distance from the pile being driven, as well as the additional data indicated in section 6 of the LOA.

3.3.1.2 During-Activity monitoring

During all in-water construction, observers will use binoculars and the naked eye to search continuously for marine mammals. Monitoring distances will be measured with range finders. Pile driving will cease if any marine mammal is detected in or approaching the shutdown zone (i.e. Level A [PTS onset] harassment zone] up to 150 meters). If a marine mammal is observed in the disturbance zone (I.e. Level B [behavioral] harassment zone and, if present, the Level A [PTS onset] harassment zone] beyond 150 meters), but not approaching or entering the shutdown zone, a take will be recorded, and the work will be allowed to proceed without cessation. All species that enter either the Level A or Level B harassment zones will be monitored and documented, with the PSO estimating the amount of time the animal spends within the Level A or Level B zone while pile driving is underway. PSOs must record all observations of marine mammals, regardless of distance from the pile being driven, as well as the additional data indicated in section 6 of the LOA. In the event of a shutdown, pile driving will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have elapsed without re-detection of the animal.

3.3.1.3 Post-Activity Monitoring

Monitoring must take place through 30 minutes post-completion of pile driving activity. PSOs must record all observations of marine mammals, regardless of distance from the pile being driven, as well as the additional data indicated in section 6 of this LOA.

3.4 Data Collection

PSOs must use approved sighting form Attachments 3 through 5. The marine mammal report must contain the informational elements described in the Monitoring Plan and, at minimum, must include:

- Dates and times (begin and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including:
    - the number and type of piles that were driven or removed and by what method (i.e., impact or vibratory);
    - Total duration of driving time for each pile (vibratory driving) and number of strikes for each pile (impact driving); and
- PSO locations during marine mammal monitoring;
- Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance;
- Upon observation of a marine mammal, the following information:
    - Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting;

  - Time of sighting;
  - Identification of the animal(s) (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;
  - Distances and location of each marine mammal observed relative to the pile being driven or removed for each sighting;
  - Estimated number of animals (min/max/best estimate);
  - Estimated number of animals by cohort (adults, juveniles, neonates, group composition, etc.);
  - Animal's closest point of approach and estimated time spent within the harassment zone;
  - Description of any marine mammal behavioral observations (e.g., observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (e.g., no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching);
- Number of marine mammals detected within the harassment zones, by species; and
- Detailed information about any implementation of any mitigation triggered (e.g., shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any;

To the extent practicable, PSOs will record behavioral observations that may make it possible to determine whether the same or different individuals are being taken as a result of project activities over the course of a day.

The Lead PSO shall be responsible for consistency in data collection and shall consult with NAVFAC and the Installation NRM to ensure consistency and oversight on the data collection. The Contractor and/or Lead PSO will update the NRM weekly to keep the NRM abreast of the current take estimate, ensuring authorized takes are not exceeded. Should the project “take” 80% of the authorized takes for a species, the NRM will be immediately notified. The NRM will in turn notify the Region SME in order to coordinate additional takes with NMFS.

Chapter 4. Hydroacoustic Monitoring Plan

This section comprises the hydroacoustic monitoring plan for the Bulkhead repairs S45N at Naval Station Newport in Newport, Rhode Island. The submitted application and issued authorization stipulate the number and types of piles and activities that the project must collect acoustic data for.

4.1 Objectives

The purpose of hydroacoustic monitoring, or sound source verification (SSV), is to characterize underwater noise from pile driving activities during various types of pile driving, extraction, and down-the-hole drilling associated with this project. Data collected will be reported to NMFS, as required by the issued authorization. Data collected can also be used in future environmental planning and consultation documents.

4.2 Survey Locations

Acoustic sound levels will be collected and evaluated during pile driving activities. All sound source verification shall be conducted in accordance with NMFS guidance (NMFS 2012) Hydrophones would be placed at locations 33 ft from the noise source and, where the potential for level A (PTS onset) harassment exists, at a second representative monitoring location that is a distance of 20 times the depth of water at the pile location. For the pile driving events acoustically measured, 100 percent of the data will be analyzed.

A stationary hydrophone system with the ability to measure SPLs will be placed in accordance with NMFS most recent guidance for the collection of source levels. Hydroacoustic monitoring will be successfully conducted for at least 10 percent and up to 10 of each different type of pile and each method of installation (Table 13-1). The resulting data set will be analyzed to examine and confirm SPLs and rates of transmission loss for each separate in-water construction activity. Hydrophones will be placed using a static line deployed from a stationary (temporarily moored) vessel. Locations of hydroacoustic recordings will be collected via GPS. A depth sounder and/or weighted tape measure will be used to determine the depth of the water. The hydrophone will be attached to a weighted nylon cord or chain to maintain a constant depth and distance from the pile area. The nylon cord or chain will be attached to a float or tied to a static tine.

Each hydrophone will be calibrated at the start of each action and will be checked frequently to the applicable standards of the hydrophone manufacturer. Environmental data would be collected, including but not limited to, the following: wind speed and direction, air temperature, humidity, surface water temperature, water depth, wave height, weather conditions, and other factors that could contribute to influencing the airborne and underwater sound levels (e.g**.,** aircraft, boats, etc.). The chief inspector would supply the acoustics specialist with the substrate composition, hammer model and size, hammer energy settings and any changes to those settings during the piles being monitored, depth of the pile being driven, and blows per ft for the piles monitored.

4.3 Temporal Considerations

Measurements shall be collected during the whole pile-driving/extracting/drilling event, but during data analysis only the periods of maximum hammer energy will be characterized. Maximum hammer energy is characterized by removing starts (ramp up of hammer energy) and stops (ramp down of hammer energy) from data being analyzed.

4.4 Sound Source Verification Numbers

One whole pile driving event will be characterized as one sample. Vibratory and pile driving and down-the-hole drilling events will all be considered separately from each other. Bathymetry, substrate type, distance from shore, water depth, and hammer energy will all be recorded and reported.

Numbers and types of piles, as well as the methods of installation/extraction will be in accordance with the issued authorization (Table 4). Vibratory drilling and Obstruction drilling, down-the-hole hammer were not included in the original application. The two newly added activities will not be performed until the amendment is approved by NOAA's National Marine Fisheries Service (NMFS).

Table 4: Numbers of Piles to be Measured for Pile Driving

Pile Size and Type	Method of Install/Extraction	Number to Monitor
22.5 inch Z-shaped sheets*	Vibratory	10
30 inch steel pipe	Vibratory	2
14 inch H-pile*	Vibratory	10
Obstruction Drilling	Down-the-hole Hammer	8 (maximum)

4.5 Monitoring Equipment Proposed for Use

The recording equipment will be capable of recording the minimum bandwidth required per NMFS 2012 guidelines. For this project, the specific equipment that will be used for acoustic monitoring is a Larson Davis Sound Advisor Sound Meter, Model 831C with attached hydrophone. Equipment specifications can be found in Attachment 4 (Hydroacoustic Monitoring Equipment).

4.6 Data Processing

Acoustic monitoring will include the measurement of peak sound pressures, root-mean-square sound pressure levels (RMS) and sound exposure levels (SEL). Different data processing is required to characterize source levels for vibratory pile driving than for impact driving. For vibratory pile driving, characterize overall dBrms levels by taking 10 sec averages across the whole event and averaging all the 10 sec periods. Averaging 10 sec periods will likely capture the variation in sound levels over the pile-driving event. For impact pile driving, characterize overall dBrms levels by integrating sound for each waveform across 90% of the acoustic energy in each wavy (using the 5-95 percentiles to establish the 90% criterion) and averaging across all waves in the pile-driving event.

The underwater acoustic recordings or measured data will be analyzed to provide peak, RMS, and SEL sound pressure levels along with narrow or 1/3rd octave band frequency spectra.

For acoustically monitored piles, data from the monitoring locations will be post-processed to obtain the following sound measures:

- For impact pile driving (per pile): Number of strikes and strike rate; depth of substrate to penetrate; pulse duration and mean, median, and maximum sound levels (dB re: 1 ftPa): root mean square sound pressure level (SPLrms); cumulative sound exposure level (SELcum), peak sound pressure level (SPLpeak), and single-strike sound exposure level (SELs-s);
- For vibratory driving/removal (per pile): Duration of driving per pile; mean, median, and maximum sound levels (dB re: 1 µPa): root mean square sound pressure level (SPLrms), cumulative sound exposure level (SELcum) (and timeframe over which the sound is averaged)

Chapter 5. Interagency Notification for Injured or Dead Marine Mammals

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the Holder must report the incident to the Office of Protected Resources (OPR), NMFS *(PR.ITP.MonitoringReports@noaa.gov* and *ITP.Laws@NOAA.gov)* and to the Greater Atlantic Region New England/Mid- Atlantic Regional Stranding Coordinator (978-282-8478 or 978-281-9291) as soon as feasible. If the death or injury was clearly caused by the specified activity, the Holder must immediately cease the activities until NMFS OPR is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of this LOA. The Holder must not resume their activities until notified by NMFS.

The report must include the following information:

1. Time, date and location (latitude/longitude) of first discovery (and updated location information if known and applicable;
2. Species identification (if known) or description of animal(s) involved;
3. Condition of animal(s) (including carcass condition if the animal is dead);
4. Observed behaviors of the animal(s), if alive;
5. If available, photographs or video footage of animal(s); and
6. General circumstances under which the animal was discovered.

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

In the event the Navy discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition), the Navy must immediately report the incident to the Office of Protected Resources, NMFS, and the Greater Atlantic Coast Region Stranding Coordinator, NMFS. The report must include the same information identified above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with the Navy to determine whether additional mitigation measures or modifications to the activities are appropriate.

In the event the Navy discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the specified activities (i.e., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the Navy must report the incident to the Office of Protected Resources, NMFS, and the Greater Atlantic Coast Region Stranding Coordinator, NMFS, within 24 hours of the discovery.

Chapter 6. Reporting

Monitoring reports will be provided to NMFS in accordance with the issue authorization. Reports will be submitted to the Navy 30 days before the due date to NMFS for internal Navy review.
All draft and final monitoring reports must be submitted to *PR.ITP.MonitoringReports@noaa.gov* and *ITP.Laws@NOAA.gov).* The reporting procedures are summarized below.

6.1 Annual Reports

The Holder must submit its annual report(s) on all monthly conducted under this LOA within 90 calendar days of the completion of monitoring as well as the 5-year comprehensive summary report at the end of the project. The report(s) will detail the monitoring protocol and summarize the data recorded during monitoring of each bulkhead section of the project. Final annual reports (each portion of the project and comprehensive) must be prepared and submitted within 30 days following resolution of any NMFS comments on the draft report. If no comments are received from NMFS within 30 days of receipt of the draft report, the report must be considered final. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

6.2 Final Report

A comprehensive summary report would be submitted to NMFS within 90 calendar days of the completion of hydroacoustic measurements and marine mammal monitoring. The final report will synthesize the data recorded during hydroacoustic and marine mammal monitoring and estimate the number of marine mammals that may have been harassed through the entire project. The results would be summarized in graphical form and include summary statistics and time histories of sound values based upon the data from the activities monitored for this LOA period. Similar to the annual reports, NMFS would provide comments within 30 days after receiving this report, and the Navy would address the comments and submit revisions within 30 days of receipt. If no comment is received from NMFS within 30 days, the draft report would be considered as final.

6.3 Reporting Requirements

The marine mammal report must contain the informational elements described in the Monitoring Plan and, at minimum, must include:

- Dates and times (begin and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including:
    - the number and type of piles that were driven or removed and by what method (i.e., impact or vibratory);
    - Total duration of driving time for each pile (vibratory driving) and number of strikes for each pile (impact driving); and
- PSO locations during marine mammal monitoring;
- Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance;
- Upon observation of a marine mammal, the following information:
    - Name of PSO who sighted the animal(s) and PSO location and
    - activity at time of sighting;
    - Time of sighting;
    - Identification of the animal(s) (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;
    - Distances and location of each marine mammal observed relative to the pile being driven or removed for each sighting;
    - Estimated number of animals (min/max/best estimate);
    - Estimated number of animals by cohort (adults, juveniles, neonates, group composition, etc.);
    - Animal's closest point of approach and estimated time spent within the harassment zone;
    - Description of any marine mammal behavioral observations (e.g., observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (e.g., no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching);
- Number of marine mammals detected within the harassment zones, by species; and
- Detailed information about any implementation of any mitigation triggered (e.g., shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any;

The Holder must submit all PSO datasheets and/or raw sighting data with the

- draft reports referenced in condition 6(a) of this LOA.
- The acoustic monitoring report must contain the informational elements described in the Acoustic Monitoring Plan and, at minimum, must include:
    - Hydrophone equipment and methods: recording device, sampling rate, distance (m) from the pile where recordings were made; depth of water and recording device(s);
    - Type and size of pile being driven, substrate type, method of driving during recordings (e.g., hammer model and energy), and total pile driving duration;
    - Whether a sound attenuation device is used and, if so, a detailed description of the device used and the duration of its use per pile;
    - For impact pile driving (per pile): Number of strikes and strike rate; depth of substrate to penetrate; pulse duration and mean, median, and maximum sound levels (dB re: 1 ftPa): root

mean square sound pressure level (SPLrms); cumulative sound exposure level (SELcum), peak sound pressure level (SPLpeak), and single-strike sound exposure level (SELs-s);

- For vibratory driving/removal (per pile): Duration of driving per pile; mean, median, and maximum sound levels (dB re: 1 µPa): root mean square sound pressure level (SPLrms), cumulative sound exposure level (SELcum) (and timeframe over which the sound is averaged); and
- One-third octave band spectrum and power spectral density plot.

Chapter 7 Literature Cited

Department of Commerce. National Oceanic and Atmospheric. (2021). 50 CFR Part 217 [Docket No. 211208–0254] RIN 0648–BK69. Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to U.S. Navy Construction at Naval Station Newport in Newport, Rhode Island

Navy. (2018). Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase Ill Training and Testing. Naval Undersea Warfare Center Division, Newport, Rhode Island. NUWC-NPT Technical Report, August 2018.

NAVFAC. Request for Regulations and Letters of Authorization for the Incidental Taking of Marine Mammals Resulting from Bulkhead Replacement Repairs at Naval Station Newport, Rhode Island.

REQUEST FOR LETTER OF AUTHORIZATION

UNDER THE MARINE MAMMAL PROTECTION ACT FOR

BULKHEAD REPLACEMENT/REPAIRS

AT

NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Submitted to:

Office of Protected Resources, National Marine Fisheries Service, National Oceanographic and AtmosphericAdministration

Prepared by:

Naval Facilities Engineering Command Mid-Atlantic

Prepared for:

Naval Station Newport

May 27, 2020

Request for Letter of Authorization for Bulkhead Replacement/Repairs at Naval Station Newport, Newport, RI

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EXECUTIVE SUMMARY

In accordance with the Marine Mammal Protection Act (MMPA) of 1972, as amended, the U.S. Navy (Navy) is applying for a Letter of Authorization (LOA) for activities associated with the proposed repair and/or replacement of bulkheads at Naval Station (NAVSTA) Newport in Newport, Rhode Island. Construction would occur in phases over approximately 5 years (May 15, 2022 through May 14, 2027). At this time, pile driving activities are anticipated to be completed within 4 years. However, because the proposed construction is dependent on the allocation of funding, the Navy is requesting that the LOA be issued for the entire 5-year construction period to ensure flexibility in the project schedule. The Navy determined that noise from pile installation activities has the potential to rise to the level of harassment under the MMPA.

NAVSTA Newport is proposing to replace five sections and repair one section of deteriorating, unstable, hazardous, and eroding bulkhead, sheet pile, and revetment (approximately 2,730 total linear feet) along the Coddington Cove waterfront of NAVSTA Newport. Over time, the existing storm sewer systems and bulkheads along the Coddington Cove waterfront have severely degraded due to erosion from under-capacity stormwater system piping and aging infrastructure. This impacts the ability of the installation to minimize shoreline erosion and safety risks from associated upland subsidence while maintaining potential berthing space. The purpose of the Proposed Action is to maintain stable, safe, and, sealed bulkheads along all of NAVSTA Newport's waterfront properties.

In this LOA application, the Navy has used National Marine Fisheries Service (NMFS) promulgated thresholds (NMFS 2018a) to estimate the number of Level A (Permanent Threshold Shift [PTS]) and Level B (behavioral) takes that would result from pile driving activities. Empirically measured source levels from impact and vibratory pile driving events, as reported in the literature, were used to estimate sound source levels for this project. Underwater sound transmission loss has been modeled using "practical spreading loss," which assumes a loss of 4.5 decibels (dB) with each doubling of distance. The Navy is seeking authorization for the potential Level A and Level B taking of Atlantic white-sided dolphins *(Legenorhynchus acutus)*, short-beaked common dolphins *(Delphinus delphis)*, harbor porpoises *(Phocoena phocoena)*, harbor seals *(Phoca vitulina)*, gray seals *(Halichoerus grypus atlantica)*, harp seals *(Pagophilus groenlandicus)*, and hooded seals *(Crystphora cristata)* (Table ES-1).

The takes requested are expected to have a less than significant effect on individual animals and no effect on the populations of these species. Effects experienced by individual marine mammals are expected to be primarily limited to short-term disturbance of normal behavior or temporary displacement of animals near the source of the noise.

Other in-water construction activities such as dredging, barge repositioning, welding, and grouting, do not have the potential to result in harassment under the MMPA. Only underwater sound associated with pile driving would have the potential to harass marine mammals. Turbidity created during pile installation would temporarily impact the water column. However, turbidity would return to ambient conditions within 24 hours. Therefore, construction is not anticipated to affect the prey base or significantly affect other habitat features of marine mammals that would meet the definition of take.

Table ES-1 Total Underwater Exposure Estimates by Species

Year	*Species*	*Level A (PTS onset)*	*Level B (Behavioral)*	*Total Authorized Take*
1	Atlantic white-sided dolphin	0	1	1
	Short-beaked common dolphin	0	3	3
	Harbor porpoise	1	4	5
	Harbor seal	15	188	203
	Gray seal	3	40	43
	Harp seal	1	16	17
	Hooded seal	0	0	5[1]
2	Atlantic white-sided dolphin	0	0	0
	Short-beaked common dolphin	0	2	2
	Harbor porpoise	0	2	2
	Harbor seal	13	138	151
	Gray seal	3	28	31
	Harp seal	1	11	12
	Hooded seal	0	0	5[1]
3	Atlantic white-sided dolphin	0	1	1
	Short-beaked common dolphin	0	6	6
	Harbor porpoise	2	7	9
	Harbor seal	25	353	378
	Gray seal	5	74	79
	Harp seal	2	29	31
	Hooded seal	0	0	5[1]
4	Atlantic white-sided dolphin	0	1	1
	Short-beaked common dolphin	0	3	3
	Harbor porpoise	1	4	5
	Harbor seal	19	197	216
	Gray seal	4	41	45
	Harp seal	1	16	17
	Hooded seal	0	0	5[1]

[1]- To guard against unauthorized take, the Navy is requesting 1 Level B (behavioral) take of hooded seal per month of construction when this species may occur (Jan through May) for each construction year.

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ACRONYMS AND ABBREVIATIONS

BMPs	best management practices
CALTRANS	California Department of Transportation
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CMP	corrugated metal pipe
cy	cubic yard(s)
dB	decibels
dB peak/pk	instantaneous peak sound pressure level
dB re 1 µPa	dB referenced to a pressure of 1 micropascal
dB re 1 μPa^2-s	dB referenced to a pressure of 1 micropascal squared second
DNL	Day night average sound level
ESA	Endangered Species Act
°F	Degrees Fahrenheit
FR	Federal Register
ft	feet
Hz	hertz
kHz	kilohertz
km	kilometer
km^2	square kilometer
lb	pound
LE	cumulative sound exposure
LOA	Letter of Authorization
lf	linear feet
LMR	Living Marine Resources
m	meter(s)
µPa	micropascal
MLLW	mean lower low water
MMPA	Marine Mammal Protection Act
NA	not applicable
NAVFAC	Naval Facilities Engineering Command
NAVSTA Newport	Naval Station Newport
Navy	United States Navy
NM	Nautical Miles
NMFS	National Marine Fisheries Service
NMSDD	Navy Marine Species Density Database
NOAA	National Oceanic and Atmospheric Administration
NUWCD	Naval Underwater Warfare Center Division
OU	Operable Unit
OSHA	Occupational Safety and Health Administration
Pa	Pascal(s)
PSO	Protected Species Observers
PTS	permanent threshold shift
RCRA	Resource Conservation and Recovery Act
re 1 μPa^2	referenced to a pressure of 1 micropascal square
re 20 µPa	referenced to 20 micropascals
R & D	Research and Development
RCP	reinforced concrete pipe
RMS	root mean square
ROI	Region of Influence
sec	second(s)

SEL	sound exposure level
SEL_{cum}	cumulative sound exposure level
SPL	sound pressure level
Sq ft	square feet
TL	transmission loss
TTS	temporary threshold shift
US	United States
USEPA	United States Environmental Protection Agency
WFA	weighting factor adjustments
WSDOT	Washington State Department of Transportation
ZOI(s)	zone(s) of influence

1 INTRODUCTION AND 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.

1.1 Introduction

Pursuant to the Marine Mammal Protection Act (MMPA) Section 101(a)(5)(D), the United States Navy (Navy) submits this application to National Marine Fisheries Service (NMFS) for a Letter of Authorization (LOA) for the incidental taking of marine mammal species during construction activities associated with the proposed repair/replacement of bulkheads at Naval Station Newport in Newport Rhode Island (Figure 1-1) between May 15, 2022 through May 14, 2027. Code of Federal Regulations (CFR) 50 216.104 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 first 14 chapters of this application.

Naval Station (NAVSTA) Newport, a Command of the United States (U.S.) Navy, proposes to replace or repair several sections of deteriorating, unstable, hazardous, and eroding bulkhead, sheet pile, and revetment (approximately 2,730 total linear feet [lf]) along the Coddington Cove waterfront of NAVSTA Newport in Newport Rhode Island (Figure 1-2). Over time, the existing storm sewer systems and bulkheads along the Coddington Cove waterfront have severely degraded due to erosion from under-capacity stormwater system piping and aging infrastructure. This impacts the ability of the installation to minimize shoreline erosion and safety risks from associated upland subsidence while maintaining potential berthing space.

NAVSTA Newport is required, as part of its mission, to maintain stable, safe, and, sealed bulkheads along its waterfront properties. The existing storm sewer systems and bulkheads along the Coddington Cove waterfront were originally constructed in 1942 as part of the Navy expansion of shore establishments during World War II. Construction of the Proposed Action would occur in phases over approximately 5 years (May 15, 2022 through May 14, 2027) as funding becomes available. At this time, pile driving activities are anticipated to be completed within 4 years. The repair of Section S50, scheduled to begin in October 2026 (construction year 5), would be achieved by securing plates over the holes in the existing bulkhead and would not involve pile driving or dredging as part of the proposed repairs. In-water noise generating activities from the repair of Section S50 would, therefore, be negligible and would not result in any takes of marine mammals. Therefore, this section is not discussed further in this LOA application. However, because the proposed repairs are dependent of the allocation of funding, the Navy is requesting that the LOA be issued for the entire 5-year construction period to ensure flexibility in the project schedule.

This LOA is for in-water construction occurring from May 15, 2022 through May 14, 2027 and includes all pile driving activities associated with the Proposed Action occurring during this time period. The region of influence (ROI), is the full extent of potential underwater noise impacts for the project. Dates and durations for in-water construction activities are described in detail in Chapter 2. Within the ROI, zones of influence (ZOIs) within which takes of marine mammals, as defined under the MMPA, can be anticipated, have been estimated (refer to Section 6.7).

Under the MMPA of 1972, as amended (16 United States Code Section 1371(a)(5)(D)), the Navy is requesting a LOA for pile driving activities that are expected to result in the unintentional taking of marine mammals.

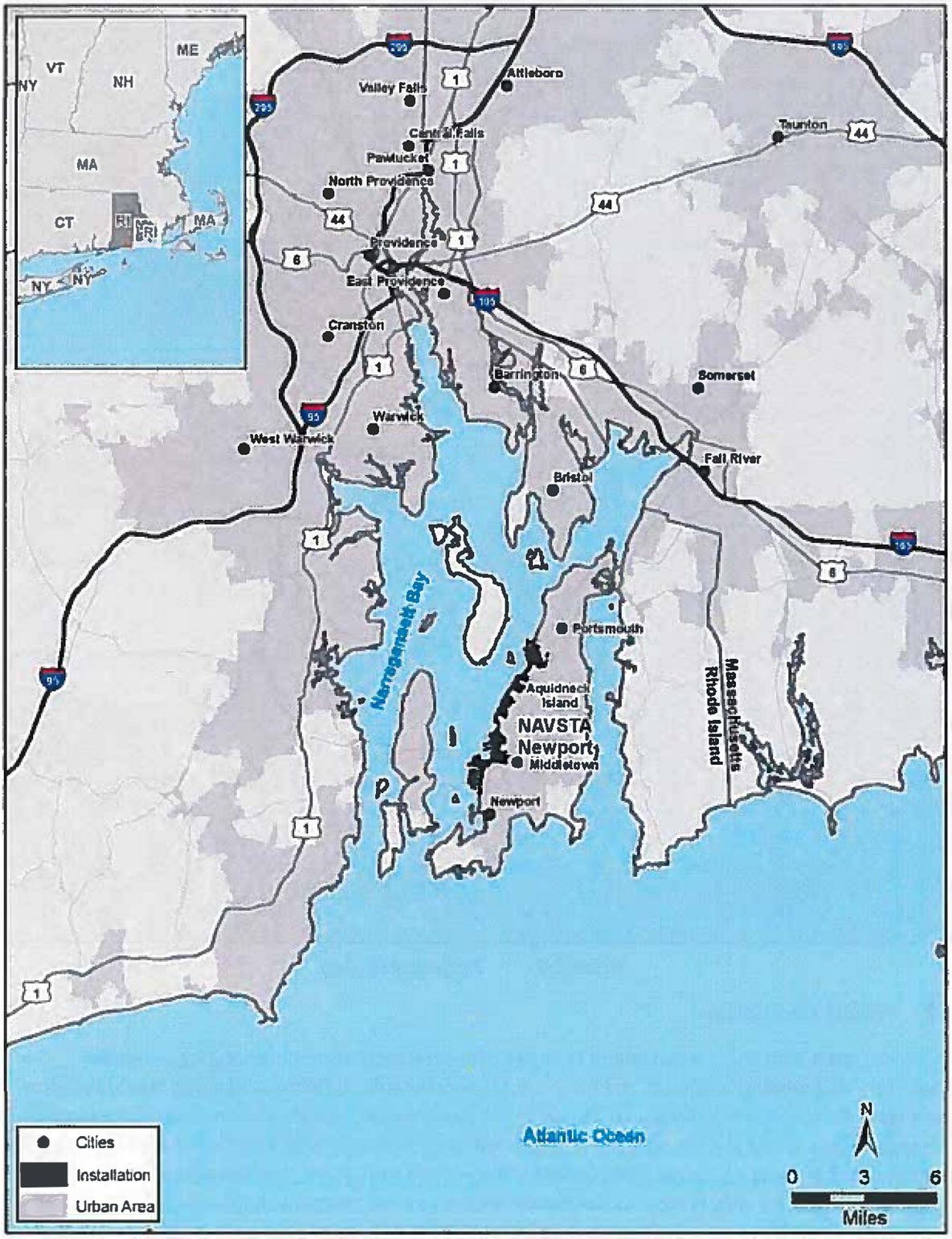


Figure 1-1 Location Map, Naval Station Newport

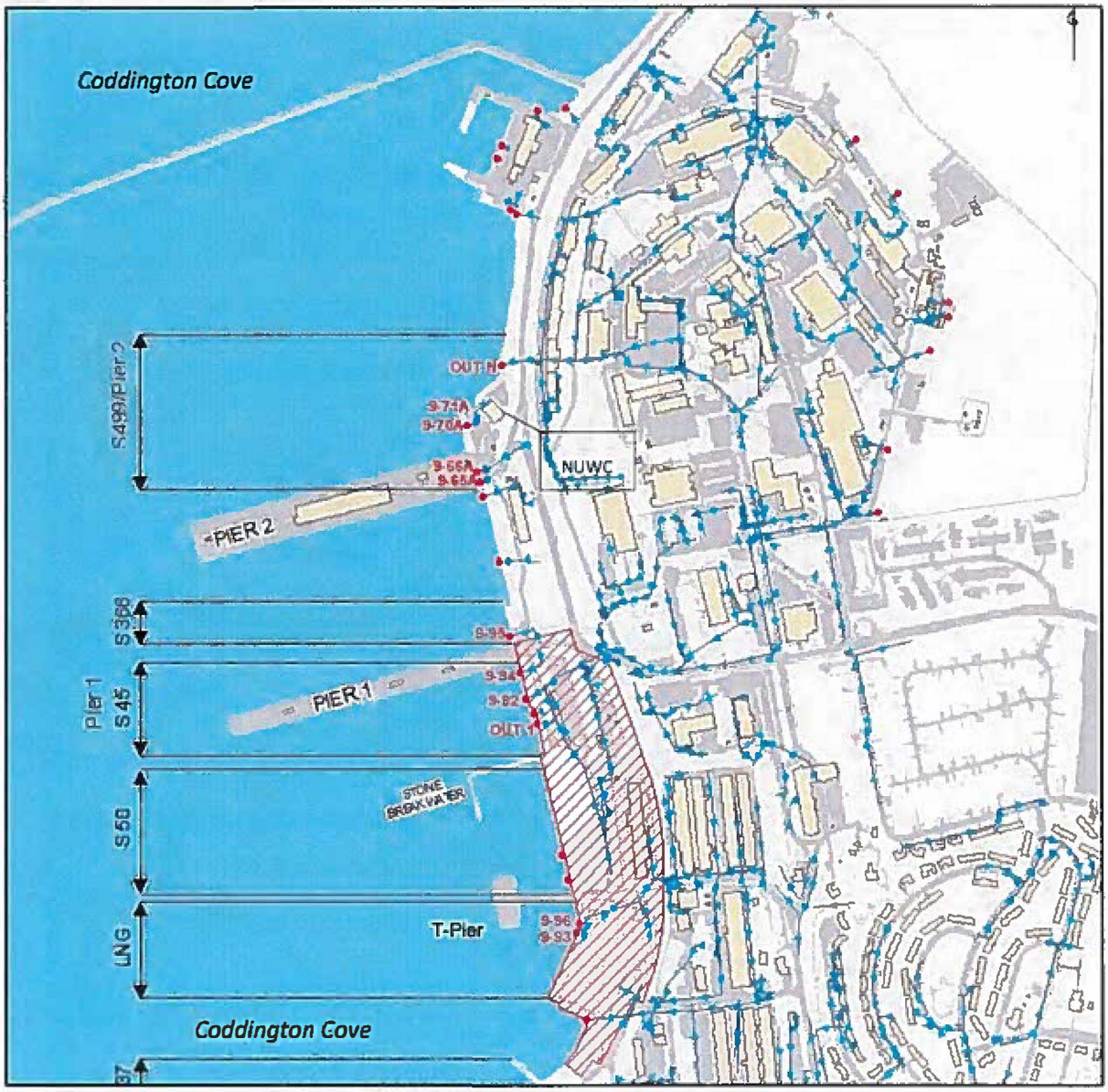


Figure 1-2 Project Site Map

1.2 Project Description

The Proposed Action is the replacement or repair of several sections of deteriorating, unstable, hazardous, and eroding bulkhead, and revetment (approximately 2,730 total lf) along the Coddington Cove waterfront of NAVSTA Newport. As part of the replacement/repairs, existing stormwater outfalls in the repair areas would also be replaced or improved. Improvements would include changing outfall pipe material and/or changing outfall pipe diameter. Stormwater outfall improvements would reduce flooding and improve conveyance, as well as minimize shoreline erosion and associated sedimentation of adjacent receiving waters. In order to properly install the new bulkheads and revetments, limited dredging would occur along the shoreline. All dredging would be performed to the extent practicable using an environmental bucket to minimize potential water column impacts. Environmental buckets are

designed to minimize sediment losses in the water column during dredging but are not suited for the removal of large debris, rocks, or piles due to the overlapping side plate design. If site conditions prevent the effective use of an environmental bucket, then a traditional dredge bucket may be employed. Dredged material would be tested and disposed of at an offsite, upland, permitted facility. The proposed location of the replacement/repairs would encompass six discrete locations that span the area from north of Pier 2 southward to an area slightly south of the Supply Depot Pier (T-pier) (see Figure 1-2). The specific sections proposed for repair/replacement are described in detail from north to south in the following paragraphs and are summarized in Table 2-1 at the end of this section.

Section S499 / Pier 2: Currently, this section of bulkhead is in serious condition and has a high priority for replacement/repair because the steel sheet pile has widespread moderate-to-advanced corrosion across multiple zones. There are also significant section losses of steel sheet pile and timber planking occurring at multiple locations. In addition, the protective coatings have separated and failed along the bulkhead.

Replacement and repair of Section S499/Pier 2 includes the demolition of the existing north marginal wharf; excavation and replacement of approximately 310 ft of existing steel bulkhead underneath and north of Pier 2; and replacement of approximately 90 ft of rip rap revetment north of Pier 2. Demolition of the marginal wharf would include the removal of approximately 8,500 square feet (sq ft) of concrete decking and the demolition of 80, 36-inch diameter, concrete encased piles.

The existing bulkhead structure would be replaced with a new combined wall system (Figure 1-3). Because of the proximity of important buildings, a deadman[1] and tie rod anchoring system cannot be installed at this location. Approximately 140 (70 pairs), 2.5-foot wide (31.5-inch), sheet piles; 35, 42-inch, steel pipe piles; and 79, 14-inch H-piles would be installed approximately 12 inches seaward of the existing bulkhead using a vibratory and impact hammer, as appropriate. The existing bulkhead would be excavated landside and cut off approximately 5 ft below ground level. The interstitial space would be backfilled with stone. The new sheet piles would be treated with a 20-mils[2]-thick coating of coal-tar epoxy and cathodic protections to resist corrosion.

Replacement of the revetment would involve removing and disposing the existing stone rip rap (Figure 1-4). Reprofiling of the revetment slope may occur if deemed necessary. The new revetment would include a geotextile underlayment and new stone rip rap and, would be within the footprint of the existing revetment. To ensure proper installation and support of the bulkhead and rip rap revetment, shoreline dredging would occur at the toe of the existing structures to remove the existing stabilizing material (stone rip rap). Approximately 575 cubic yards (cy) of rip rap and ancillary sediment would be removed from an approximately 7,650 sq ft area in front of the bulkhead and approximately 900 cy of rip rap and ancillary sediment would be removed from an approximately 1,350 sq ft area at the revetment. Offshore sediments in Coddington Cove are part of Installation Restoration (IR) Site 19, Operable Unit (OU) 5 (Figure 1-5).

[1] An object buried in or secured to the ground for the purpose of providing anchorage or leverage.

[2] A unit of length equal to one thousandth (10-3) of an inch

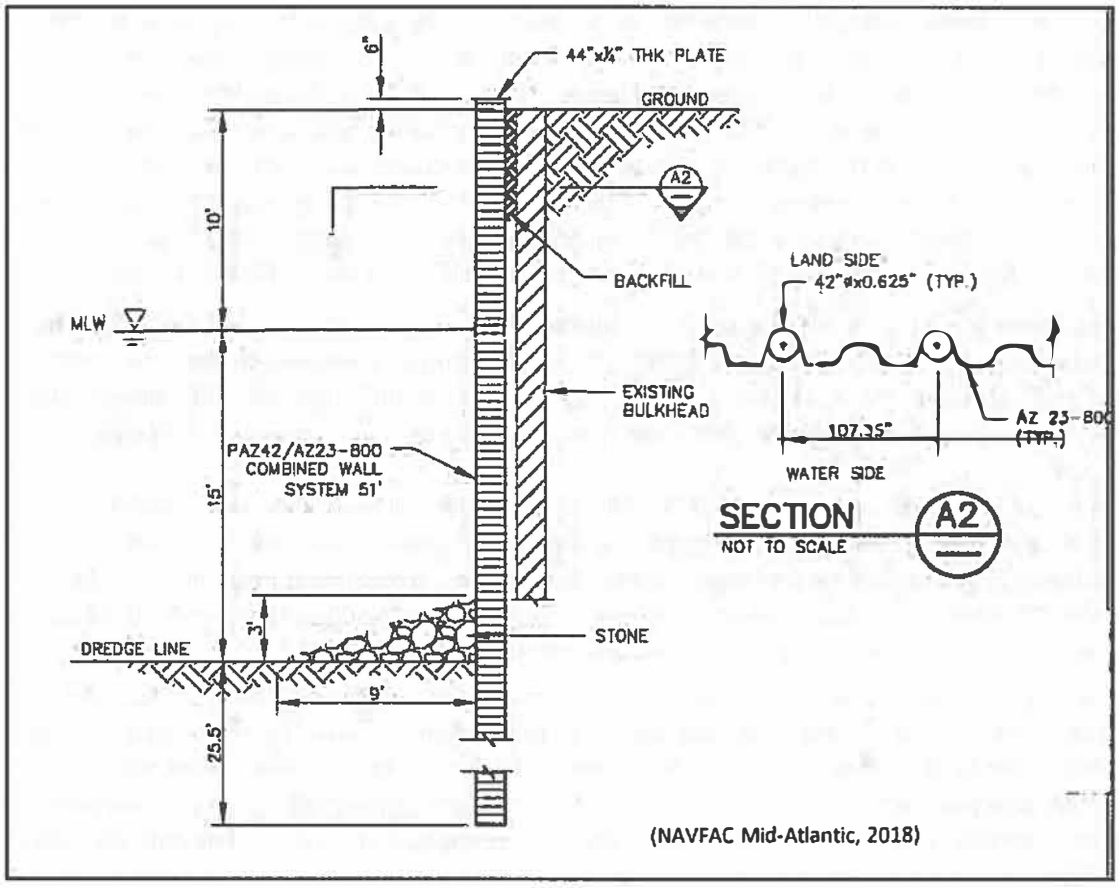


Figure 1-3 S499/Pier 2 Repair Cross Section (Typical)

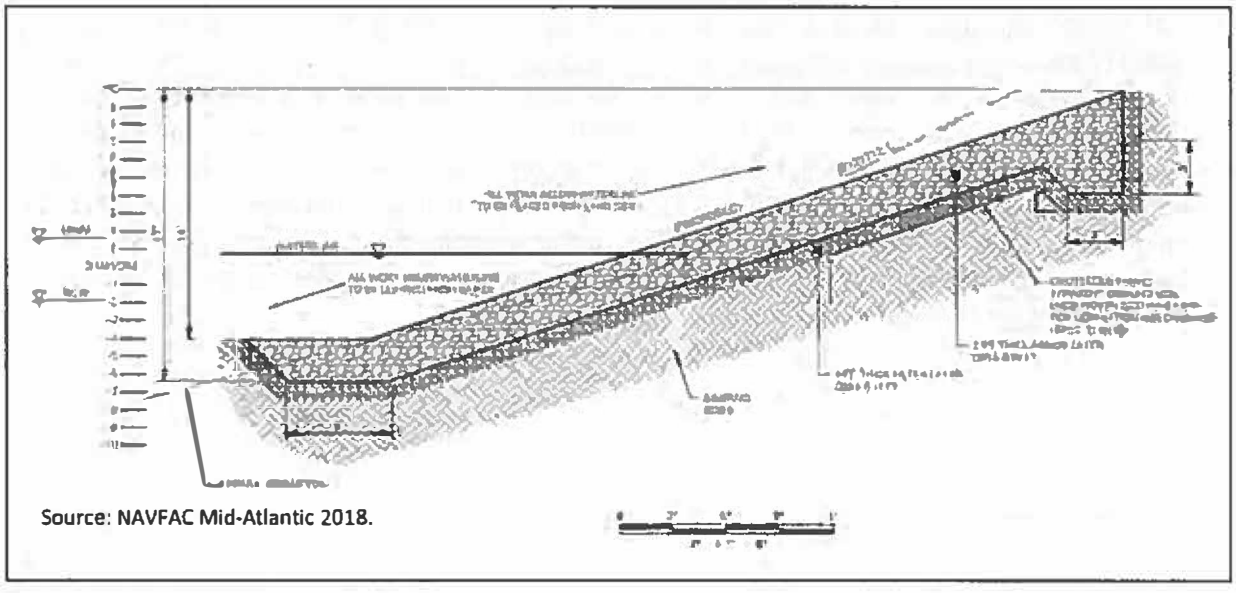


Figure 1-4 Proposed Revetment Replacement Cross Section (Typical)

Figure 1-5 Boundaries of Offshore IR Site – Derecktor Shipyard

Excavation of rip rap and ancillary sediment would be conducted in a manner that would avoid disturbing the Pier 2 sediment cap, to the extent practicable. Dredged material would be managed in accordance with Occupational Safety and Health Administration (OSHA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and, if applicable, Resource Conservation and Recovery Act (RCRA) requirements. Dredged material would be tested as per applicable disposal facility requirements prior to disposal at an offsite, upland, permitted facility. New rip rap would be installed at the toe of the bulkhead and revetment to stabilize the structures at a quantity equal to or less than what was removed.

Three existing stormwater outfalls, 9-70A, 9-66A, and 9-65A, would be improved or replaced in-kind during bulkhead replacement. Improvements would include changing outfall pipe material and/or changing outfall pipe diameter. Outfall 9-70A is located to the west of the Naval Undersea Warfare Center (NUWC) Building and outfalls 9-66A and 9-65A are located beneath Pier 2 (Figure 1-2).

Section S366: In its current condition, this section of bulkhead is in a serious condition with a high priority for replacement/repair because the steel sheet piling exhibits heavy corrosion with numerous areas that exhibit 100 percent loss of section, as well as separation of the protective coating, vegetation growth through the structure, and rust pack. The timber planking protecting the concrete encasement has rotted at the waterline in some areas.

Replacement of Section S366 would include the demolition and replacement of approximately 90 ft of existing steel sheet pile bulkhead just north of Pier 1. The existing bulkhead would then be replaced with a new deadman anchored king pile[3] system. The system would consist of approximately 28 (14 pairs), 2-foot wide (22.5-inch), Z-shaped sheet piles; 15, 30-inch diameter, steel pipe piles; and 14, 14-inch H-piles. These piles would be installed approximately 1-foot in front of the existing bulkhead using a combination of vibratory and impact hammers, as appropriate. The existing steel sheet pile wall would be excavated landside to a depth of approximately 8-10 ft and cut off at the limit of excavation. An 8-foot high concrete deadman anchor system would be installed approximately 50 ft behind the new bulkhead and would be connected to the bulkhead by tie rods (Figure 1-6). Stone would be used as the backfill material to allow a rapid drop down of the water at the back of the bulkhead after a severe storm. That stone would be topped with an 8-inch layer of concrete pavement. Excess soils and demolition debris would be disposed at an upland, offsite, permitted disposal facility. All steel elements would be coated with 16 mils-thick coal-tar epoxy.

Bulkhead replacement would include shoreline dredging to a depth of approximately -17 ft at the toe of the existing bulkhead to ensure proper installation of the new bulkhead. Approximately 100 cy of rip rap and ancillary sediment would be removed from an approximately 1,350 sq ft area in front of the bulkheads. Dredged materials would be managed and disposed as described for S499/Pier 2.

Stormwater Outfall 9-95 would be improved during bulkhead replacement. Outfall 9-95 is located just north of Pier 1 and is constructed of 24-inch corrugated metal pipe (CMP) (see Figure 1-2). Outfall 9-95 would be replaced with a 24-inch reinforced concrete pipe (RCP) to improve stormwater conveyance and discharge. In addition, an existing fuel oil pit would be demolished, and the fuel line would be capped and abandoned. Both the fuel lines and fuel oil pit are no longer in service.

[3] A pile which provides added support for a precast concrete or sheet steel pile wall.

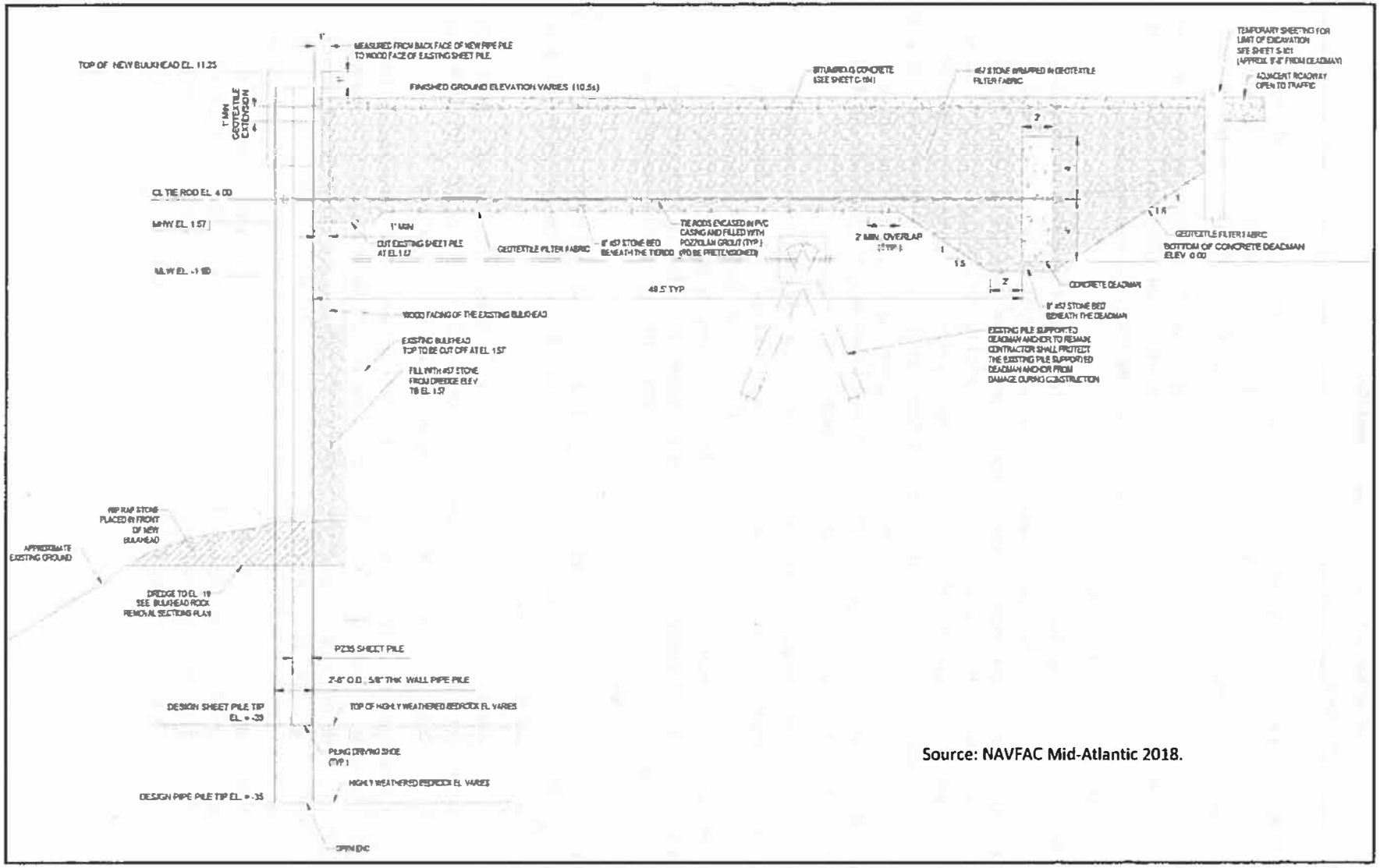


Figure 1-6 Cross Section of Proposed S366 Bulkhead Replacement (Typical)

Section Pier 1: Pier 1 was not accessible during the condition assessment and is assumed to be in similar condition as S366. The waterside inspection was limited due to the presence of vessels and other obstacles that would not allow the inspection vessel to pass (NAVFAC Mid-Atlantic, 2018).

Section Pier 1 includes demolition and replacement of approximately 100 ft of existing steel sheet pile bulkhead underneath Pier 1 (Figure 1-7). In order to access the bulkhead underneath the pier, partial demolition of Pier 1 would occur. Demolition would involve the removal of concrete decking, but the removal of support piles is not anticipated.

Should demolition of the underlying support piles be required to perform bulkhead replacement/repair, the use of impact or vibratory hammers would not be required. Piles would be cut off at mudline or extracted with a sling (i.e. dead pull). The existing steel sheet pile wall would be excavated landside to a depth of approximately 13 ft below ground surface and cut off at the limit of excavation. The existing bulkhead would then be replaced with a new deadman and tie rod anchored sheet pile system. The system would consist of approximately 54 (27 pairs), 2-foot wide (22.5-inch), Z-shaped sheet piles and approximately 26, 14-inch H-piles. These piles would be installed approximately 1-foot in front of the existing bulkhead using a combination of vibratory and impact hammers, as appropriate. All steel elements would be coated with 16 mils-thick coal-tar epoxy.

A concrete deadman anchor system would be installed behind the new bulkhead and would be connected to the bulkhead by tie rods. Because soils in this area are part of the Derecktor Shipyard IR site, excavated soils would be managed in accordance with the United States Environmental Protection Agency (USEPA) selected remedy for the site, OSHA regulations, and the Navy Soil Management Plan. Excavated soils would be disposed of at an approved, permitted, offsite facility. Stone or other inert material would be used to backfill the excavated area. Backfill material would then be topped with a 6-inch layer of bituminous concrete.

Bulkhead replacement would include shoreline dredging to a depth of approximately -14 ft at the toe of the existing bulkhead to ensure proper installation of the new bulkhead. Dredged materials would be managed and disposed as described for S499/Pier 2.

Section S45: In its current condition, this section of bulkhead is in serious condition with a high priority for replacement/repair because the steel sheet piles, and cap exhibit heavy corrosion with numerous areas that exhibit 100 percent loss of section resulting in extensive landside erosion.

Replacement of Section S45 would include the demolition and replacement of approximately 310 ft of existing steel sheet pile bulkhead just south of Pier 1. The existing bulkhead would then be replaced with a new deadman anchored king pile system. The system would consist of approximately four, 30-inch diameter, steel pipe piles; 160 (80 pairs) 2-foot wide (22.5-inch), Z-shaped sheet piles; and approximately 76, 14-inch H-piles. These piles would be installed approximately 1-foot in front of the existing bulkhead using a combination of vibratory and impact hammers, as appropriate. The existing steel sheet pile wall would be excavated landside to a depth of approximately 10 ft below ground surface, as appropriate, and cut off at the limit of excavation (Figure 1-8). All steel elements would be coated with 16 mils-thick coal-tar epoxy. Excavated soils would be managed and disposed of as described for Section Pier 1.

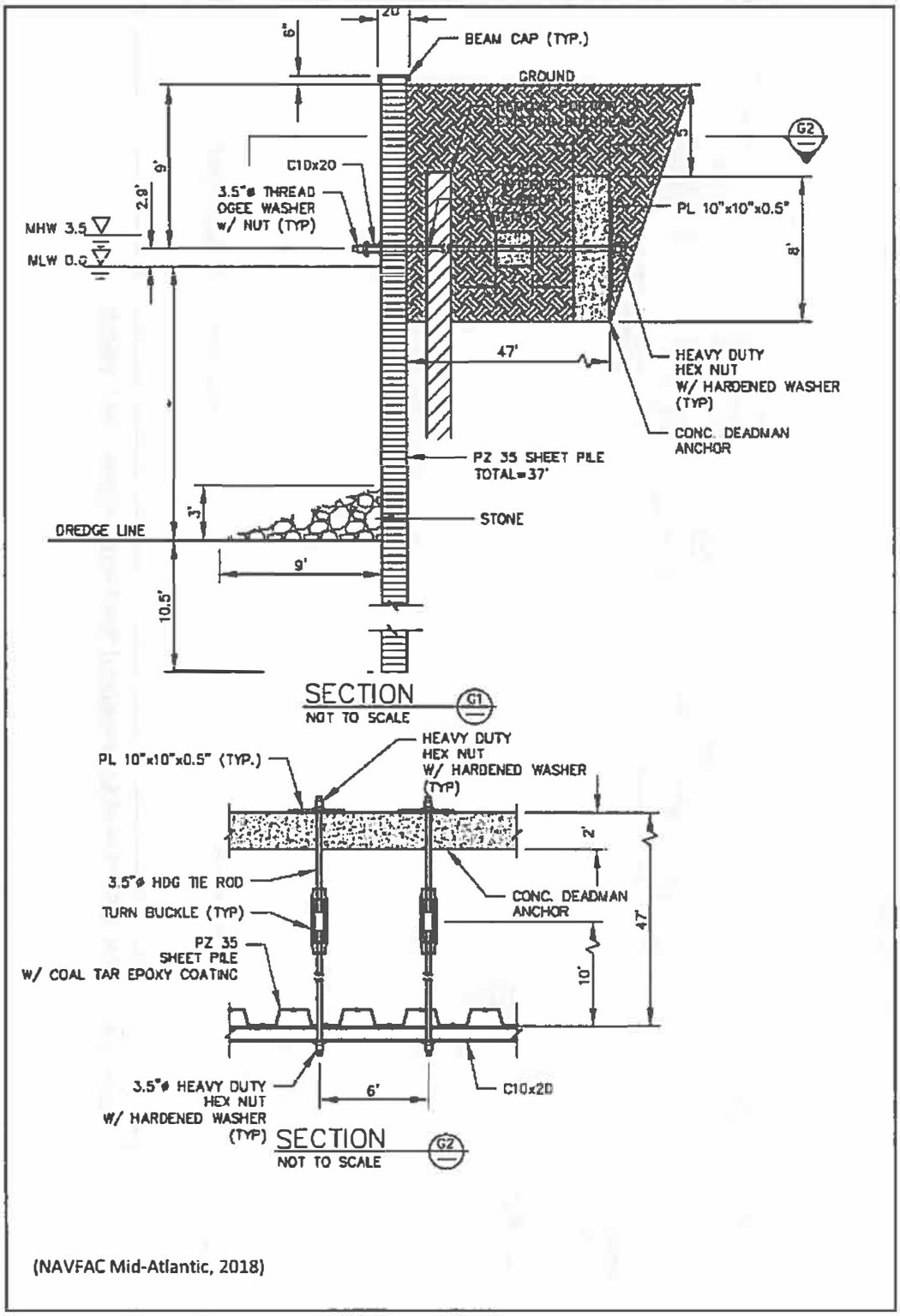
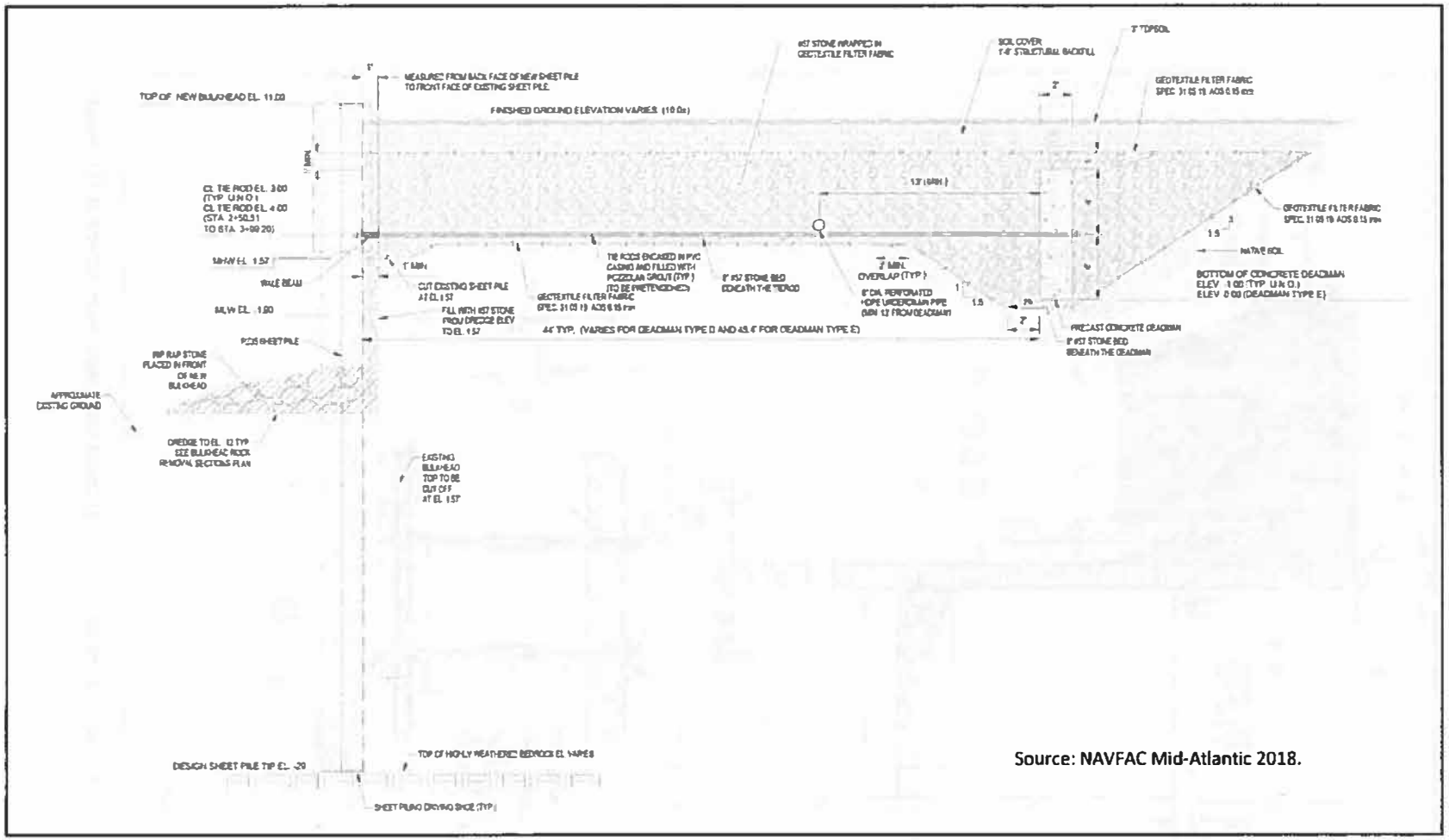


Figure 1-7 Cross Section of Pier 1 Proposed Bulkhead Replacement (Typical)



Source: NAVFAC Mid-Atlantic 2018.

Figure 1-8 Cross Section of S45 Proposed Bulkhead Replacement (Typical)

A concrete deadman anchor system would be installed behind the new bulkhead and would be connected to the bulkhead by tie rods. Stone would be used as the backfill material to allow for a rapid drop down of water behind the bulkhead after a severe storm. That stone would be topped with a layer of clean, structural fill and a layer of topsoil. Because soils in this area are part of the Derecktor Shipyard IR site, excess soils would be managed and disposed of as described for Pier 1. Section S45 also includes excavation and replacement of approximately 250 ft of existing rip rap revetment along the southern portion of S45. Approximately 1,800 cy of rip rap and concrete debris would be removed from an approximately 13,000 sq ft area. Replacement of the revetment would involve removing and disposing the existing stone rip rap and geotextile underlayment and re-grading the slope from a 2-foot vertical: 1-foot horizontal grade to a 3-foot vertical: 1-foot horizontal grade (Figure 1-4). Once grading is completed. New geotextile would be installed and covered with a 1-foot thick filter layer followed by a 2-foot thick layer of new stone rip rap. The new revetment would be within the footprint of the existing revetment.

In order to ensure proper installation and support of the bulkhead and rip rap revetment, shoreline dredging would occur at the toe of the existing structures to remove the existing stabilizing material (stone rip rap). Management and disposal of dredged material would be conducted as described for S499/Pier 2.

Select stormwater infrastructure within this section of bulkhead would be replaced during the installation process. Outfall 9-92, a 36-inch CMP, would be improved with a 54-inch RCP and Outfall 9-94, an 18-inch CMP would be improved with an 18-inch RCP. Outfall 9-110 will be eliminated and Outfall 9-124 (OUT-1), an 8" PVC pipe, will be improved with an 8" ductile iron pipe.

Section LNG: In its current condition, this section of bulkhead is in serious condition with high priority for replacement/repair due to heavy corrosion with numerous areas that exhibit 100 percent loss of section. Where the steel sheet piling is in poor condition, there is extensive landside erosion.

Section LNG includes excavation and replacement of approximately 650 ft of existing steel bulkhead south of the T-Pier. The existing bulkhead would be replaced with a new deadman anchored sheet pile system. The system would be similar to the system installed at Pier 1 and would consist of approximately 346 (173 pairs), 2-foot wide (22.5-inch), Z-shaped sheet piles; and approximately 164, 14-inch, H-piles. These piles would be installed approximately 1-foot in front of the existing bulkhead using a combination of vibratory and impact hammers. The existing steel sheet pile wall would be excavated landside to a depth of approximately 13-ft below ground surface and cut off at the limit of excavation. All steel elements would be coated with 16 mils-thick (avg.) coal-tar epoxy

A concrete deadman anchor system would be installed behind the new bulkhead and would be connected to the bulkhead by tie rods. Soils in this area are part of the Derecktor Shipyard IR site. Soils would be managed and disposed of as described for Section Pier 1. Clean fill or stone would be used to backfill the excavated area and, following completion of repairs, the site would be restored in compliance with the USEPA-approved, selected remedy for the site.

In order to ensure proper installation and support of the bulkhead, shoreline dredging would occur at the toe of the existing structure to remove the existing stabilizing material (stone rip rap). Management and disposal of dredged material would be conducted as described for S499/Pier 2.

Select stormwater infrastructure within this section of bulkhead would be replaced during the installation process. Outfall 9-96 and Outfall 9-93 would be replaced or improved during bulkhead replacement. Other outfalls occurring in this section (Outfalls OF-1, OF-2, and OF-4) are assumed to be

inactive and no longer in use. Further investigation will be conducted during the project design phase to determine whether these outfalls require replacement or improvement.

1.3 In-water Construction Activities

In-water construction activities included in this LOA request for incidental take authorization are scheduled to take place during the timeframe covered by this LOA application. Table 1-1 provides the anticipated construction schedule for the Proposed Action. At this time, pile driving activities are anticipated to be completed within 4 years. However, because the proposed repairs are dependent on the allocation of funding, the Navy is requesting that the LOA be issued for the entire 5-year construction period to ensure flexibility in the project schedule.

Table 1-1 Coddington Cove Bulkhead Replacement and Repair Summary

Section ID	*Bulkhead Replacement (lf)*	*Revetment Replacement (lf)*	*Outfalls Replaced*	*Dredging Area (sq ft)*	*Dredging Volume (cy)*	*IR Site*	*Construction Start Date*
S45	310	250	Yes (3)	8,400	650	Soil Sediment	May 15, 2022
S366	90	0	Yes (1)	1,350	100	Sediment	October 15, 2023
Pier 1	100	0	No	1,500	120	Sediment	October 15, 2023
LNG	650	0	Yes (2)	9,750	760	Soil Sediment	October 15, 2024
S499/Pier 2	510	90	Yes (5)	9,000	700	Sediment	October 15, 2025
S50	730 (repair)	0	Yes (2)	0	0	Soil Sediment	October 15, 2026

Source: NAVFAC Mid-Atlantic 2018.

1.3.1 Pile Driving

Pile installation would occur using land based or barge-mounted cranes, as appropriate. Cranes would be equipped with both vibratory and impact hammers. Piles would be installed initially using vibratory means and then finished with impact hammers, as necessary. Impact hammers would also be used where obstructions or sediment conditions do not permit the efficient use of vibratory hammers.

Vibratory hammers are routinely used to install piles when permitted by the sediment type. Vibratory hammers typically produce lower source levels of noise than impact hammers, and they can be considered as an alternative to impact hammers in order to reduce underwater sound during construction activities (ICF Jones and Strokes and Illingworth and Rodkin, Inc. 2012). They are considered a non-impulsive noise source as the hammer continuously drives the pile into the substrate. A vibratory hammer operates by using counterweights that spin to create a vibration. The vibration of the hammer causes the pile to vibrate at a high speed. The vibrating pile then causes the soil underneath it to "liquefy" and allow the pile to move easily into or out of the sediment. A model of vibratory hammer likely to be used for the project is the MKT vibratory hammer.

Impact hammers are the most common pile driving method used to install piles of various sizes (Caltrans 2015). Impact hammers typically produce greater source levels of noise than vibratory hammers and are an impulsive noise source. Impact pile drivers are piston-type drivers that use various means to lift a piston (ignition, hydraulics, or steam) to a desired height and drop the piston (via gravity) against the head of the pile in order to drive it into the substrate. The size and type of impact driver used depends on the energy needed to drive a certain type of pile in various substrates to the necessary depth. The

magnitude and characteristics of underwater noise generated by a pile strike depends on the energy of the strike and the pile size and composition. A model of impact hammer that may be used for the project is the APE D36-26 impact hammer.

Impact hammers would utilize soft start techniques to minimize noise impacts in the water column. The Navy does not yet know what type/size of hammers would be used to complete the work. For purposes of this analysis, underwater noise was modeled without accounting for potential noise minimization measures.

1.3.2 Dredging

In order to ensure proper installation and support of the bulkhead and rip rap revetment, limited shoreline dredging would occur at the toe of the existing structures to remove the existing stabilizing material (stone rip rap). All dredging would be conducted mechanically. An environmental bucket would be used for dredging to the extent practicable but may be switched to a standard bucket if site conditions prevent it from being used effectively. Environmental buckets are designed to minimize sediment losses in the water column during dredging but are not suited for the removal of large debris, rocks, or piles due to the overlapping side plate design. The dredge may be positioned on land, or if necessary, on a barge. All dredged materials would be disposed of at an approved upland disposal site. Since dredging and disposal activities would be slow moving, conducted in relatively shallow water and conspicuous to marine mammals, they pose negligible risks of physical injury.

Dredging activities would be conducted within recommended dredging windows established to protect aquatic resources (fish, shellfish, and essential fish habitat) and avoid the most biologically productive times. Naval Station Newport will coordinate with regulatory agencies with regard to dredging to ensure that dredging operations would have no significant impacts on aquatic resources.

Dredging operations do not pose a risk of physical injury to marine mammals due to the slow movement of these operations and the ease of avoidance by marine mammals. Noise created during dredging operations is unlikely to exceed that generated by other normal waterfront activities and is, therefore, not expected to result in injury or harassment of marine mammals. Therefore, no incidental takes are expected during this activity, and dredging is not discussed further in this document.

2 DATES, DURATION, AND LOCATION OF ACTIVITIES

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

2.1 Dates and Duration of Activities

In-water construction activities are currently expected to begin in late May 2022 and proceed through early May 2027 as funding becomes available (Table 1-1). During this timeframe, construction activities are expected to result in incidental takes of marine mammals during 222 non-consecutive days of in-water pile driving (Table 2-1). Other in-water construction activities such as dredging and barge repositioning, welding, and grouting would not result in takes of marine mammals. All work will be limited to daylight construction. In-water construction is anticipated to be completed by early May 2027.

Certain activities may occur at the same time, decreasing the total number of pile driving days. The contractor could be working in more than one area of the bulkheads at a time. It is not possible to predict if and/or how often work will occur simultaneously. This is simply a situation that may occur as the construction schedule allows. The annual report required as part of the permit will include the information on days of duration of overlap. Overlap days were not included in the calculations as schedule changes may impact the ability to perform work concurrently and reduce the overall duration of the sound producing activity.

NMFS does not recommend combining multiple sound sources to analyze the cumulative impact zones for both Level A (PTS onset) and Level B (behavioral) harassment[4]. If activities occur simultaneously, the number of Level A (PTS onset) and Level B (behavioral) takes during those periods of overlap would be determined by the activities with the largest acoustic ZOIs. Level A and Level B takes are conservatively accounted for in this LOA application by assuming the activities do not overlap.

NMFS 2018 Revisions to, "Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing" (Version 2.0) states; "The recommended application of the weighted cumulative sound exposure level (SELcum) metric is for individual activities/sources. It is not intended for accumulating sound exposure from multiple activities occurring within the same area or over the same time or to estimate the impacts of those exposures to an animal occurring over various spatial or temporal scales. Current data available for deriving thresholds using this metric are based on exposure to only a single source and may not be appropriate for situations where exposure to multiple sources is occurring. As more data become available, the use of this metric can be re-evaluated, in terms of appropriateness, for application of exposure from multiple activities occurring in space and time." While not specifically stated in the guidance, similar uncertainty applies to the combination of SPLs emanating from different sources at different locations.

[4] 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.

The specific arrangements of concurrent pile driving are unknown until the pile driving activities begin and thus there is no way to calculate the exact distances and combined sources levels. For Level B (behavioral) harassment, the impact zone distance from concurrent pile driving from more than one hammer would only be affected if the driving methods are vibratory and running concurrently. In most cases, the vibratory distance would extend the furthest due to the higher sources level, if they are closely located. If they are spread apart (>30 meters [m]), separate zones from each hammer can be used. For Level A harassment, energy summation is impossible to predict. However, the current method that treats each source independently has its own Level A (PTS onset) zone is more conservative than one larger zone with combined sources. Finally, the relatively small, closed area of the construction site means that ensonified zones (particularly for Level B [behavioral] harassment) will be confined within a cumulative 13 square kilometer area.

2.2 Project Location Description

NAVSTA Newport, established during the Civil War era, encompasses 1,399 acres extending 6–7 miles along the western shore of Aquidneck Island in the towns of Portsmouth, Rhode Island, and Middletown, Rhode Island, and the City of Newport, Rhode Island (Figure 1-1). The base footprint also includes the northern third of Gould Island in the town of Jamestown, Rhode Island. The base is located in the southern part of the state near where Narragansett Bay adjoins the Atlantic Ocean.

The locations of the proposed bulkhead repairs at Coddington Cove are identified in Figure 1-2.

2.2.1 Bathymetric Setting

Narragansett Bay is one of Rhode Island's principle water features. Narragansett Bay is approximately 22 nautical miles (NM) (40 kilometers [km]) long and 7 NM (16 km) wide. The average depth of Narragansett Bay is 29 ft. The Narragansett Bay's most prominent bathymetric feature is a submarine valley that runs between Conanicut and Aquidneck Islands to Rhode Island Sound, and defines the East Passage of Narragansett Bay. The shipping channel in the East Passage serves as the primary shipping channel for the rest of Narragansett Bay and is generally 100 ft deep. The shipping channel from the lower East Passage splits just south of Gould Island with the western shipping channel heading to Quonset Point and the eastern shipping channel heading to Providence and Fall River (Navy, 2008).

Coddington Cove is located on the western side of Aquidneck Island and is a protected embayment formed by Coddington Point to the south and a 4,000-foot-long rubble-mound breakwater to the north. It covers an area of 1.6 square NM with water depths up to 50 ft. The area is a Restricted Area and is closed to all commercial and recreational vessel traffic, unless authorized by the appropriate personnel (Navy, 2008).

According to a 2015 bathymetric survey of Coddington Cove, water depths in the proposed project area are less than 34 ft mean lower low water (MLLW) (Figure 2-1). Water depths in the pier are artificially deep to accommodate the berthing of large ships (NAVFAC, 2015).

Table 2-1 Bulkhead Pile Installation Activity

Facility	*Method of Pile Driving*	*Pile Type*	*Pile Size*	*Number of Sheets (pairs)/Piles*	*Strikes per Pile*	*Vibratory Driving Minutes per Pile*	*Maximum Number of Piles Installed per Day*	*Maximum Number of Pile Driving Days*
S45	Vibratory/Impact	Z-shaped Steele Sheet Pilee	3.75 ft per pair/22.5-inch each	80 pair	NA	13	10	27
	Impact	Steel Pipe Pile	30-inche	4	530	NA	2	4
	Vibratory	Steel H-pile	14-inche	76	NA	10	12	13
S366	Vibratory/Impact	Z-shaped Steele Sheet Pilee	3.75 ft pere pair/22.5-inch eache	14 pair	NA	13	10	5
	Impact	Steel pipe pile	30-inche diametere	15	530	NA	2	15
	Vibratory	Steel H-pile	14-inche	14	NA	10	12	3
S499/Pier 2	Vibratory/Impact	Z-shaped Steele Sheet Pilee	5.25 ft pere pair/31.5-e inch eache	70 pair	NA	13	8	23
	Impact	Steel Pipe Pile	42-inche	35	530	NA	4	18
	Vibratory	Steel H-pile	14-inche	79	NA	10	12	14
LNG	Vibratory/Impact	Z-shaped Steele Sheet Pilee	3.75 ft pere pair/22.5-inch eache	173 pair	NA	13	10	58
	Vibratory	Steel H-pile	14-inche	164	NA	10	12	28
Pier01	Vibratory/Impact	Z-shaped Steele Sheet Pilee	3.75 ft pere pair/22.5-inch eache	27 pair	NA	13	10	9
	Vibratory	Steel H-pile	14-inch	26	NA	10	12	5
Total sheet piles pairs/pipe and H-piles installed				364/413				
Total days pile driving								222

Legend: NA = not applicable, ft = foot; Start date of in-water work and duration are to be determined.

Source: Navy 2019a.

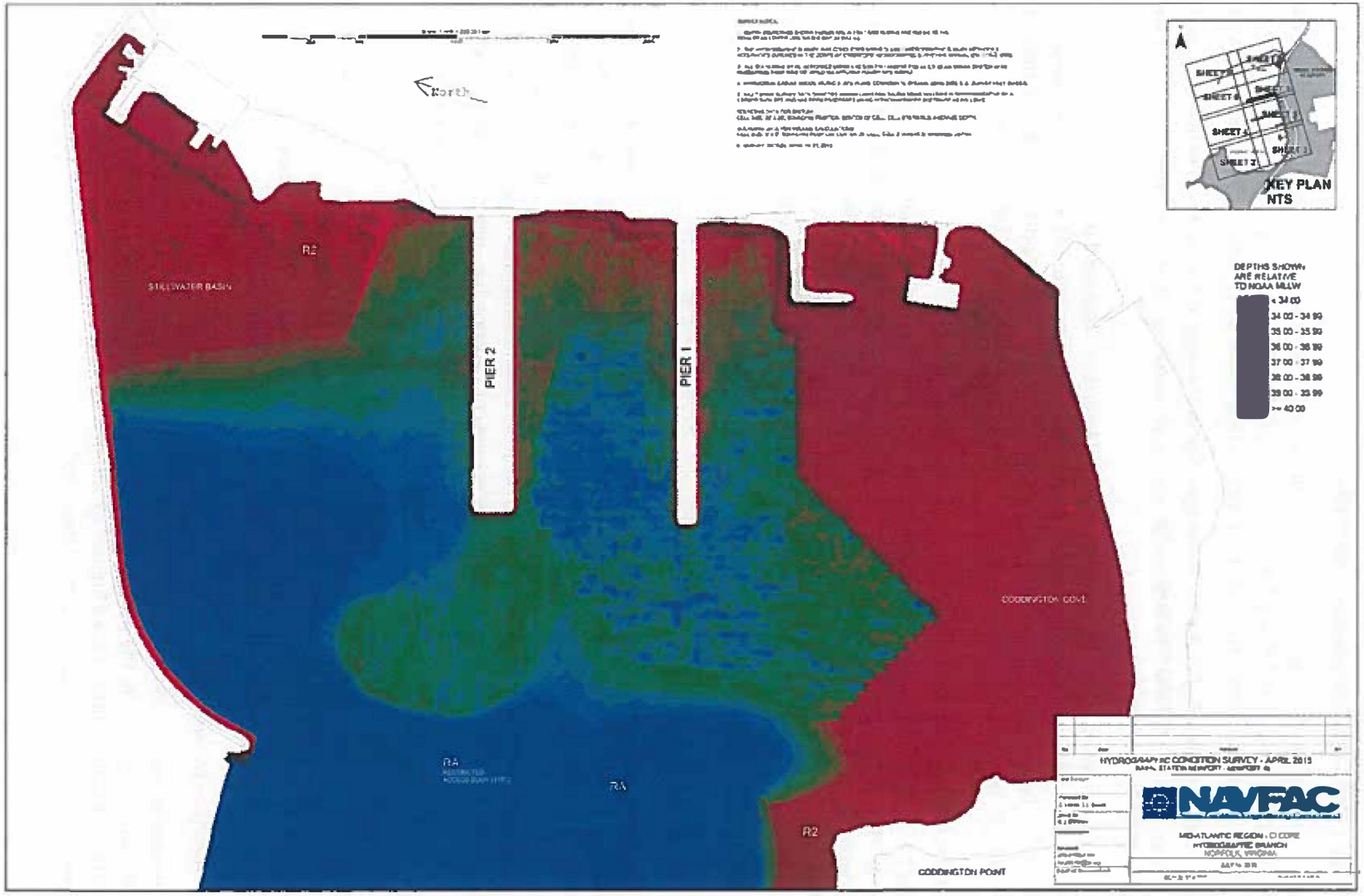


Figure 2-1 Bathymetry in the Proposed Project Area of Coddington Cove

2.2.2 Tides, Circulation, Temperature, and Salinity

The tides in Coddington Cove are semi-diurnal, with two high tides and two low tides per day. The range of high to low tide varies from 1.9 to 1.1 meters (m) (Pilson, 1985). Due to the presence of breakwaters and other shoreline structures, tidal circulation and current within Coddington Cove is generally weak.

Water temperatures recorded at the NOAA Gauging Station located at the southern extent of Coasters Harbor Island (Station 8452660 Newport) range from approximately 36 degrees Fahrenheit (°F) in winter to upwards of 68 °F in summer.

Salinity in the proposed project area is approximately 31 parts per thousand (Hicks, No date)). In general, salinity in Narragansett Bay increases from the head to the entrances and from the surface to the bottom. The bottom water is essentially uniform in salinity from the middle of the Bay to the head, while the surface salinities progressively decrease over the same distance (Hicks, No date).

2.2.3 Substrates and Habitats

According to a 2017 benthic survey, three habitat types are present in Coddington Cove: 1) silty sand/sandy silt areas where much of the bottom is visible, and macroalgae is sparse; 2) areas of narrow bands where the substrate is covered by shells and macroalgae is abundant; and, 3) large expanses of silt bottom with little to no macroalgae. The silt bottom habitat is the most prevalent habitat type in the cove (AECOM, 2017). No Submerged Aquatic Vegetation was observed in the proposed project areas.

2.2.4 Ambient Sound

2.2.4.1 Underwater Sound

The ambient underwater soundscape refers to noise that already exists in the environment prior to the introduction of another noise generating activity. Ambient underwater sound can originate from a number of sources that are both natural and manmade. Natural sources of ambient sound include biological sources, such as various marine species, and physical sources, such as wind, waves, and rain (Richardson et al. 1995). Human-generated sound sources can include vessel noise (i.e., commercial shipping/container vessels), seismic air guns, and marine construction (i.e., pile driving or drilling).

Recent underwater noise data collected at the NUWC during testing indicated that true ambient conditions (without static from our source) of underwater noise are approximately 120-123 dB referenced to a pressure of 1 micropascal (dB re 1 µPa) root mean square (RMS). The test site was directly adjacent to the wharf at Stillwater and 1.5 m below the surface. NUWC personnel indicated that a recording in the open water and at greater depth would likely be less (Iafrate, 2017). Because the proposed repairs would occur in shallow nearshore waters, for purposes of this analysis, ambient underwater noise in the project area is considered to be 120 dB RMS.

2.2.4.2 Airborne Sound

The existing noise environment in the vicinity of the project area is typical of an industrial area. Although no specific data is available for the project area, sound levels in and around the area are expected to be similar to those found on other mixed industrial/commercial areas, with an expected day night average sound level (DNL) of approximately 60 dBA (Navy, 2009).

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3 MARINE MAMMAL SPECIES AND NUMBERS

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

Two types of marine mammals, pinnipeds, and cetaceans, inhabit Rhode Island waters during at least a portion of the year. There are no marine mammal species that occur regularly in Narragansett Bay listed under the Endangered Species Act (ESA).

Several species of ESA listed whales occur seasonally in the waters off Rhode Island including Humpback (*Megaptera novaeangliae*), Fin (*Balaenoptera physalus*), Sei (*Balaenoptera borealis*), Sperm (*Physeter macrocephalus*) and North Atlantic Right whales (*Eubaleana glacialis*). These whales are seasonally present in New England waters; however, due to the depths of Narragansett Bay and near shore location of the action area, these listed marine mammals are unlikely to occur (NUWC Division, 2011). Therefore, these species are not discussed in this LOA application.

Table 3-1 lists seven species for which density and distribution indicate that take is reasonably foreseeable and therefore are included in this LOA application. Also included in the table is estimated density, season of occurrence, likelihood of occurrence within the project area and stock abundance for each species. Chapter 4 contains life history information for each species.

All species densities are from the U.S. Navy Marine Species Density Database (NMSDD) (Navy, 2017a) for which data of monthly densities of species were evaluated in terms of minimum, maximum, and average annual densities within Narragansett Bay. Average densities were used for all cetaceans evaluated in this application. The NMSDD models densities for harbor and gray seals as a guild due to difficulty in distinguishing these species at sea. Harbor seal is expected to be the most common pinniped in Narragansett Bay with year-round occurrence (Kenney and Vigness-Raposa, 2010). Therefore, the maximum density for the harbor-gray seal guild was used for harbor seal. Gray seals are the second most likely seal, next to harbor seals, to be observed in Rhode Island waters with densities more common during the spring to early summer as a result of strandings and occasional during other months of the year (Kenney, 2020). Therefore, the average density for the harbor-gray seal guild was used for gray seal occurrence in Narragansett Bay. Minimum densities were used for harp seal and hooded seals as they are considered occasional visitors in Narragansett Bay but much more rare than harbor and gray seals (Kenney, 2015). The species density for hooded seal was too low to result in any calculated takes. Therefore, to guard against unauthorized take, the Navy is requesting 1 Level B (behavioral) take of hooded seal per month of construction when this species may occur (Jan through May) for each construction year.

Table 3-1 Marine Mammals with the Potential to Occur in Narragansett Bay

Species and Stock	*Stock Abundance*	*Relative Occurrence in Narragansett Bay*	*Season(s) of Occurrence in Western North Atlantic*	*Density in the Project Area (species/km²)*
Atlantic white-sided dolphin (*Lagenorhyncus acutus*) *Western North Atlantic Stock*	48,819 (CV = 0.61)[1]	Occasional	Year-round low densities	0.003[5]
Common dolphin/Short-beaked (*Delphinus delphis delphis*) *Western North Atlantic Stock*	70,184 (CV = 0.28)[1]	Occasional	Summer and Fall (June – November)	0.011[5]
Harbor porpoise (*Phocoena phocoena*) *Gulf of Maine/Bay of Fundy*	79,883 (CV = 0.32)[1]	Occasional	Spring (October - June)	0.012[5]
Harbor seal (*Phoca vitulina vitulina*) *Western North Atlantic Stock*	75,834 (CV = 0.15)[2e]	Common	Year-round	0.623[5]
Gray seal (*Halichoerus grypus atlantica*) *Western North Atlantic Stock*	505,000 (95% CI = 329,000 – 682,000)[3]	Occasional	Spring to Summer (March – June)	0.131[5]
Harp seal (*Pogophilus groenlandicus*) Western North Atlantic stock	7,400,000[4]	Rare	Winter to Spring (January – May)	0.050[5]
Hooded seal (*Crystphora cristata*) Western North Atlantic Stock	593,500 (CV = 0.10)[4]	Rare	Winter to Spring (January-May)	0.001[5,6]

Legend: CV = coefficient of variation; CI = confidence interval; sq km = square kilometer.

Notes: [1]Palka, 2012.

[2]Waring et al., 2015, as cited in Hayes et al., 2019.e

[3]Canadian Department of Fisheries and Oceans, 2014, as cited in Hayes et al., 2019 (model-based estimates derivede from pup surveys).

[4]Hayes et al., 2019.

[5]Navy,2017a.

[6]To guard against unauthorized take, the Navy is requesting 1 Level B (behavioral) take of hooded seal per month ofe construction when this species may occur (Jan through May) for each construction year.

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 Atlantic White-Sided Dolphin

4.1.1 Status and Management

The Atlantic white-sided dolphin is a member of the family Delphinidae. They can measure up to 9 ft in length and reach a weight of 400 to 500 pounds (lbs). Atlantic white-sided dolphins have a lifespan of approximately 25 years and are named after their distinctive yellowish-tan streak on their sides (NOAA Fisheries, 2020a).

Based on the distribution of sightings, strandings, and incidental takes, there are possibly three population units of Atlantic white-sided dolphin: Gulf of Maine, Gulf of St. Lawrence, and Labrador Sea populations (Palka et al., 1997). Until further research is conducted, the western North Atlantic stock of white-sided dolphins may contain multiple demographically independent populations. The animals in U.S. waters are part of the Gulf of Maine population (Hayes et al., 2019). The Atlantic white-sided dolphin is protected under the MMPA, but not listed under the ESA.

4.1.2 Distribution

Atlantic white-sided dolphins are found in the temperate waters of the North Atlantic and specifically off the coast of North Carolina to Maine in U.S. waters (NOAA Fisheries, 2020a). The Gulf of Maine population of white-sided dolphin primarily occurs in continental shelf waters from Hudson Canyon to Georges Bank, and in the Gulf of Maine and lower Bay of Fundy. From January to May they occur in low numbers from Georges Bank to Jeffreys Ledge (off New Hampshire). They are most common from June through September from Georges Bank to lower Bay of Fundy, with densities declining from October through December (Hayes et al., 2019).

4.1.3 Site-Specific Occurrence

Since stranding recordings for the Atlantic white-sided dolphin began in Rhode Island in the late 1960s, this species has become the third most frequently recorded small cetacean. There are occasional unconfirmed opportunistic reports of white-sided dolphins in Narragansett Bay, typically in fall and winter. Atlantic white-sided dolphins in Rhode Island are inhabitants of the continental shelf, with a slight tendency to occur in shallower water in the spring when they are most common (approximately 64 percent of records). Seasonal occurrence of Atlantic white-sided dolphins decreases significantly following spring with 21 percent of records in summer, 10 percent in winter, and 7.6 percent in fall (Kenny and Vigness-Raposa, 2010).

4.2 Short-Beaked Common Dolphin

4.2.1 Status and Management

The short-beaked common dolphin is a member of the family Delphinidae and is one of the most abundant and familiar dolphins in the world. They occur primarily in areas of abundant prey in

association with underwater ridges, seamounts, and continental shelves. Short-beaked common dolphins have a distinctive color pattern or "hourglass" dark gray cape that extends along the back from the head to just below the dorsal fin where a "V" is visible on either side of the body, creating an hourglass. They are small, measuring under 6 ft long and weighing approximately 170 lbs (NOAA Fisheries, 2020b). The short-beaked common dolphin is protected under the MMPA, but not listed under the ESA.

4.2.2 Distribution

The short-beaked common dolphin is one of the most widely distributed species of cetaceans, found world-wide in temperate and subtropical seas. In the North Atlantic, they are common along the shoreline of Massachusetts and at sea sightings have been concentrated over the continental shelf between the 100-m and 2000-m isobaths over prominent underwater topography and east to the mid-Atlantic Ridge. The short-beaked common dolphin can be found from Cape Hatteras northeast to Georges Bank from mid-January to May and in Gulf of Maine from mid-summer to autumn (Hayes et al., 2019).

4.2.3 Site-Specific Distribution

Short-beaked common dolphins occur in the Rhode Island waters (encompassing Narragansett Bay, Block Island Sound, Rhode Island Sound, and nearby coastal and continental shelf areas) year-round. They occur across much of the shelf but most commonly in waters deeper than approximately 60 m. Seasonality is not particularly strong, but sightings are more common in spring at approximately 35 percent of records followed by 26 percent in summer, 22 percent in winter, and 18 percent in fall (Kenny and Vigness-Raposa, 2010).

Strandings occur year-round. In the stranding record for Rhode Island, common dolphins are the second most frequently stranded cetacean (exceeded only by harbor porpoises) and the most common delphinid. There were 23 strandings in Rhode Island between 1972 and 2005 (Kenny and Vigness-Raposa, 2010). A short-beaked common dolphin was most recently recorded in Narragansett Bay in October of 2016 (Hayes et al., 2019). There are no recent records of common dolphins far up rivers, however such occurrences would only show up in the stranding database if the stranding network responded, and there is no centralized clearinghouse for opportunistic sightings of that type. In Rhode Island, there are occasional opportunistic reports of common dolphins in Narragansett Bay up as far as the Providence River, usually in winter.

4.3 Harbor Porpoise

4.3.1 Status and Management

The harbor porpoise is a member of the family Phocoenidae. Adult harbor porpoises range from 5 to 5.5 ft in length and can weigh up to 170 lbs. They are a toothed whale species and can be recognized by their small, robust, dark gray body with grayish-white sides, triangular dorsal fin, and short rostrum. Harbor porpoises are considered sexually dimorphic, with females being slightly larger than males (NOAA Fisheries, 2020c).

Based on genetic analysis, it is assumed that harbor porpoises in the U.S. and Canadian waters are divided into four populations, as follows: 1) Gulf of St. Lawrence; 2) Newfoundland; 3) Greenland; and 4)

Gulf of Maine/Bay of Fundy (Hayes et al., 2019). The Gulf of Maine/Bay of Fundy Stock is likely to occur in the proposed project area. Harbor porpoise are protected under the MMPA, but not listed under the ESA.

4.3.2 Distribution

Harbor porpoises are found in northern temperate and subarctic coastal and offshore waters in both the Atlantic and Pacific Oceans. In the western North Atlantic, harbor porpoises are found in the northern Gulf of Maine and southern Bay of Fundy region in waters generally less than 150 m deep, primarily during the summer (July to September). During fall (October to December) and spring (April to June), harbor porpoise are widely dispersed between New Jersey and Maine. Lower densities of harbor porpoise occur during the winter (January to March) in waters off New York to New Brunswick, Canada (Hayes et al., 2019).

4.3.3 Site-Specific Occurrence

Harbor porpoise are the most stranded cetacean in Rhode Island. Their occurrence is strongly seasonal, and the highest occurrence is in spring at approximately 70 percent of all records. Their occurrence is the least common during the fall at approximately 3 percent with increases of approximately 8 percent and 20 percent in summer and winter, respectively (Kenny and Vigness-Raposa, 2010). It is possible harbor porpoise occur in Narragansett Bay during the winter, but reports are second- and third-hand anecdotal reports (Kenny, 2013).

4.4 Harbor Seal

4.4.1 Status and Management

Harbor seals are members of the true seal family Phocidae. Adults are sexually dimorphic, and males are generally larger than females. Adult harbor seals can reach up to 6.3 ft in length and weigh up to 245 lbs. As with other phocids, harbor seals lack external ear flaps, and their rear flippers do not rotate. Harbor seals are commonly a blue-gray color on their back with a speckling of both light and darker colors; however, their coloration may vary. Their concave, dog-like snout and their "banana-like" position while hauled out aids in their identification (NOAA Fisheries, 2020d). Harbor seals are protected under the MMPA, but not listed under the ESA.

4.4.2 Distribution

Harbor seals occur in all nearshore waters of the North Atlantic and North Pacific Oceans and adjoining seas above approximately 30°N (Burns, 2009). They are year-round residents in the coastal waters of eastern Canada and Maine, occurring seasonally from southern New England to New Jersey from September through late May. Harbor seals' northern movement occurs prior to pupping season that takes place beginning in May through June along the Maine coast. In autumn to early winter, harbor seals move southward from the Bay of Fundy to southern New England (Hayes et al., 2019). Overall, there are five recognized subspecies of harbor seal, two of which occur in the Atlantic Ocean. The western Atlantic harbor seal is the subspecies likely to occur in the proposed project area. There is some uncertainly about the overall population stock structure of harbor seals in the western North Atlantic Ocean. However, it is theorized that harbor seals along the eastern U.S. and Canada are all from a single population (Temte et al., 1991).

4.4.3 Site-Specific Occurrence

Harbor seals are regularly observed around all coastal areas throughout Rhode Island, and occasionally well inland up bays, rivers, and streams. In general, rough estimates indicate that approximately 100,000 harbor seals can be found in New England waters (DeAngelis, 2020). It should be noted for all the seals that the available data are strongly dominated by stranding records, which comprised 446 out of 507 total records for harbor seals (88 percent) (Kenny and Vigness-Raposa, 2010). Seals are very difficult to detect during surveys, since they tend to be solitary and the usual sighting cue is only the seal's head above the surface. Of the available records, 52.5 percent are in spring, 31.2 percent in winter, 9.5 percent in summer, and 6.9 percent in fall. In Rhode Island, there are no records offshore of the 90-m isobath. Based on seasonal monitoring in Rhode Island, seals begin to arrive in Narragansett Bay in September, with numbers slowly increasing in March before dropping off sharply in April. By May, seals have left the Bay (DeAngelis, 2020).

Seasonal nearshore marine mammal surveys were conducted at NAVSTA Newport between May 2016 and February 2017. The surveys were conducted along the western shoreline of Coasters Harbor Island northward to Coggeshall Point and eastward to include Gould Island. The only species that was sighted during the survey was harbor seal. During the spring survey, one harbor seal was sighted on 12 May 2016. The seal was observed near the surface of the water and engaged in several small dives during the encounter. A group of three harbor seals was sighted on 1 February 2017, during the winter survey. All three of the harbor seals were at the surface and watched the vessel pass. One dead harbor seal carcass was observed in the 12 May 2016 survey and reported to the Mystic Aquarium Stranding Network (Moll, et al., 2016, 2017; Navy, 2017b).

In Rhode Island waters, harbor seals prefer to haul out on well-isolated intertidal rock ledges and outcrops. Numerous Naval Station employees have reported seals hauled out on an intertidal rock ledge north-northwest of Coddington Point named "The Sisters" (Figure 4-1) (NUWC Division, 2011). This haul out has been studied by the NUWC Division Newport since 2011 and has demonstrated a steady increase in use during winter months when harbor seals are present in the bay. Harbor seals are rarely observed at The Sisters haul out in the early fall (September – October) but consistent numbers in mid-November (0-10 animals) are regularly observed with a gradual increase of 20+ animals until peak numbers in the upper 40s occur during March, typically at low tide. The number of harbor seals begin to drop off in April and by mid-May are not observed hauled out at all (DeAngelis, 2020). Haul out spaces at The Sister's haul out site is primarily influenced by tide level, swell, and wind direction (splashing the haul out) (Moll et al., 2017; DeAngelis, 2020).

Including The Sister's haul out, there are 22 haul out sites in Narragansett Bay (Figure 4-1). During a one day Narragansett Bay-wide count in 2018, there were at least 423 seals observed, all 22 haul out sites were represented. Preliminary results from the Bay-wide count for 2019 recorded 572 harbor seals which also included counts from Block Island (DeAngelis, 2020).

4.5 Gray Seal

4.5.1 Status and Management

Gray seals, which are also members of the "true seal" family (Phocidae), are a coastal species that generally remains within the continental shelf region. However, they do venture into deeper water, as they have been known to dive up to 1,560 ft to capture prey during feeding. Gray seals primarily feed on fish, squid, various crustacean species, and octopus.

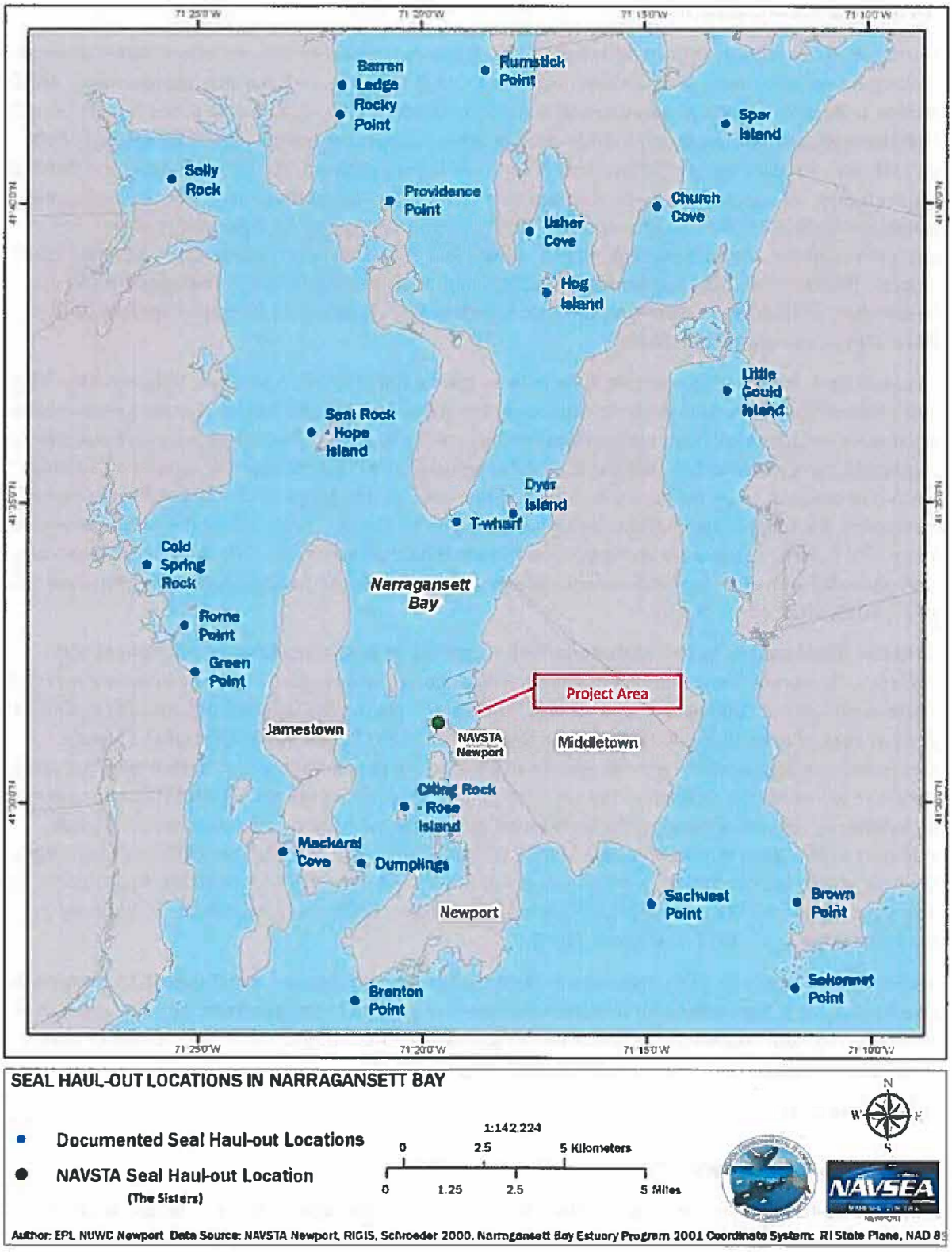

Figure 4-1 Seal Haul Outs in Narragansett Bay

Adult gray seals are sexually dimorphic, with males generally being larger than females. Adult males can reach up to 10 ft in length and weigh up to 880 lbs. Adult females can reach up to 7.5 ft in length and can weigh up to 550 lb. This species lacks external ear flaps, and its rear flippers do not rotate. Depending on its geographic location and sex, gray seal appearance and coloration varies. Adult females have a silver-gray coat with darker spots scattered over their body, and while males generally have similar color patterns, they have a prominent, long-arched nose (NOAA Fisheries, 2020e).

Gray seals can be found on both sides of the North Atlantic. Within western North Atlantic, gray seals are split into three primary populations: 1) eastern Canada, 2) northwestern Europe, and 3) the Baltic Sea (Katona, Rough, & Richardson, 1993). Gray seals are protected under the MMPA but are not listed under the ESA.

4.5.2 Distribution

Gray seals within U.S. waters are considered the western North Atlantic stock and are expected to be part of the eastern Canadian population. In U.S. waters, year-round breeding of approximately 400 animals has been documented on areas of outer Cape Cod and Muskeget Island in Massachusetts. In general, this species can be found year-round in the coastal waters of the Gulf of Maine (Hayes et al., 2019).

4.5.3 Site-Specific Occurrence

Gray seal occurrences in Rhode Island are mostly represented by stranding records—155 of 193 total records (80 percent). Gray seal records in the region are primarily from the spring (approximately 87 percent), with much smaller numbers in all other seasons (5.7 percent in winter, 5.2 percent in summer, and 2.1 percent in fall). Strandings were broadly distributed along ocean-facing beaches in Long Island and Rhode Island, with a few spring records in Connecticut (Kenny and Vigness-Raposa, 2010). As with other seals, habitat use by gray seals in Rhode Island is poorly known. They are seen mainly when stranded or hauled out and infrequently at sea. There are very few observations of gray seals in Rhode Island other than strandings. The annual numbers of gray seal strandings in the Rhode Island study area since 1993 have fluctuated markedly, from a low of 1 in 1999 to a high of 24 in 2011 (Kenney, 2020). The very strong seasonality observed in gray seal occurrence in Rhode Island between March and June is clearly related to the timing of pupping in January–February. Most stranded individuals encountered in Rhode Island area appear to be post-weaning juveniles and starved or starving juveniles (Nawojchik, 2002; Kenney, 2005). Annual informal surveys conducted since 1994 observed a small number of gray seals in Narragansett Bay in 2016 (ecoRI News, 2016).

4.6 Harp Seal

4.6.1 Status and Management

Harp seals are also members of the true seal family. Unlike the gray seal and harbor seal, harp seals exhibit little sexual dimorphism. Males are generally only slightly larger than females, reaching up to 6 ft in length and weighing approximately 300 lb. Females generally reach up to 5 ft in length and weigh up to 290 lb. Adult harp seals are a light-gray color with black faces and a horseshoe-shaped black saddle on their back. They also have a distinctive block-shaped head. As with other true seal species, harp seals lack external ear flaps, and their rear flippers do not rotate (NOAA Fisheries, 2020f).

Harp seals are classified into three stocks, which coincide with specific pupping sites on pack ice. These

pupping sites are as follows: 1) Eastern Canada, including the areas off the coast of Newfoundland and Labrador and the area near the Magdalen Islands in the Gulf of St. Lawrence; 2) the West Ice off eastern Greenland, and 3) the ice in the White Sea off the coast of Russia (Hayes et al., 2019). Harp seals are protected under the MMPA but are not listed under the ESA.

4.6.2 Distribution

The harp seal is a highly migratory species, and its range can extend from the Canadian Arctic to New Jersey. In U.S. waters, the species has an increasing presence in the coastal waters between Maine and New Jersey and are considered members of the western North Atlantic stock with general presence from January through May (Hayes et al., 2019).

4.6.3 Site-Specific Occurrence

Harp seals in Rhode Island are known almost exclusively from strandings (approximately 98 percent). Strandings are widespread on ocean-facing beaches throughout Long Island and Rhode Island and the records are almost entirely from spring (approximately 68 percent) and winter (approximately 30 percent). Harp seals are nearly absent in summer and fall. Harp seals also make occasional appearances well inland up rivers (Kenny and Vigness-Raposa, 2010). During late winter of 2020, a healthy harp seal was observed hauled out and resting near "The Sisters" haul out site (DeAngelis, 2020).

4.7e Hooded Seal

4.7.1 Status and Management

Hooded seals are also members of the true seal family (Phocidae) and are generally found in deeper waters or on drifting pack ice. Like both the gray seal and harbor seal, hooded seals are also sexually dimorphic. Males are generally much larger than females, reaching up to 8.5 ft in length and weighing approximately 776 lbs. Females generally reach up to 7 ft in length and weigh up to 440 lbs. Hooded seals are a silver-gray color with dark marks in varying sizes and shapes on their coats. Adult males have a stretchy cavity, or hood, in their nose that can inflate to look like a bright red balloon. They also have another inflatable nasal cavity in the form of a black bladder on their head (NOAA Fisheries, 2020g).

The world population of hooded seals has been divided into three stocks, which coincide with specific breeding areas, as follows: 1) Northwest Atlantic, 2) Greenland Sea, and 3) White Sea (Hayes et al., 2019). Hooded seals are protected under the MMPA but are not listed under the ESA.

4.7.2 Distribution

The hooded seal is a highly migratory species, and its range can extend from the Canadian Arctic to as far south as Puerto Rico (Mignucci-Giannoni and Odell, 2001 as cited in Hayes et al., 2019). In U.S. waters, the species has an increasing presence in the coastal waters between Maine and Florida. Hooded seals in the U.S. are considered members of the western North Atlantic stock and generally occur in New England waters from January through May and further south off the southeast U.S. coast and in the Caribbean in the summer and fall seasons (McAlpine et al. 1999; Harris et al. 2001; and Mignucci-Giannoni and Odell, 2001 as cited in Hayes et al., 2019).

4.7.3 Site-Specific Occurrence

Hooded seal occurrences in Rhode Island are predominately from stranding records (approximately 99

percent). They are rare in summer and fall but most common in the area during spring and winter (45 percent and 36 percent of all records, respectively) (Kenney, 2005; Kenny and Vigness-Raposa, 2010). Hooded seal strandings are broadly distributed across ocean-facing beaches in Rhode Island and they occasionally occur well up rivers, but less often than harp seals. Hooded seals have been recorded in Narragansett Bay but are considered occasional visitors and are expected to be the least encountered seal species in the Bay (RICRMC, 2010).

5 TYPE OF 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.

5.1 Take Authorization Request

Under the MMPA (16 U.S. Code Section 1371 (a) (5) (D)), the Navy requests a LOA for the incidental take of marine mammals by harassment as described within this application during proposed bulkhead replacement/repair at Naval Station Newport in Newport, Rhode Island. As described in detail in Chapter 6, the Navy requests an LOA for the incidental take of marine mammals listed in Table 5-1 for a period of 5 years from May 15, 2022 to May 14, 2027. Refer to Table 6-18 for a complete breakdown of takes by species and year.

Table 5-1 Total Underwater Exposure Estimates by Species

Year	Species	Level A (PTS onset)	Level B (Behavioral)	Total Authorized Take
1	Atlantic white-sided dolphin	0	1	1
	Short-beaked common dolphin	0	3	3
	Harbor porpoise	1	4	5
	Harbor seal	15	188	203
	Gray seal	3	40	43
	Harp seal	1	16	17
	Hooded seal	0	0	5[1]
2	Atlantic white-sided dolphin	0	0	0
	Short-beaked common dolphin	0	2	2
	Harbor porpoise	0	2	2
	Harbor seal	13	138	151
	Gray seal	3	28	31
	Harp seal	1	11	12
	Hooded seal	0	0	5[1]
3	Atlantic white-sided dolphin	0	1	1
	Short-beaked common dolphin	0	6	6
	Harbor porpoise	2	7	9
	Harbor seal	25	353	378
	Gray seal	5	74	79
	Harp seal	2	29	31
	Hooded seal	0	0	5[1]
4	Atlantic white-sided dolphin	0	1	1
	Short-beaked common dolphin	0	3	3
	Harbor porpoise	1	4	5
	Harbor seal	19	197	216
	Gray seal	4	41	45
	Harp seal	1	16	17
	Hooded seal	0	0	5[1]

1- To guard against unauthorized take, the Navy is requesting 1 Level B (behavioral) take of hooded seal per month of construction when this species may occur (Jan through May) for each construction year.

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as:

any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (50 CFR, Part 216, Subpart A, Section 216.3-Definitions).

5.2 Method of Incidental Taking

This authorization request considers noise from vibratory and impact pile installation as outlined in Chapters 1 and 2 that have the potential to disturb or displace marine mammals or produce a temporary shift in their hearing ability (temporary threshold shift [TTS]) resulting in Level B (behavioral) harassment as defined above. Impact pile driving of steel H-piles, pipe piles, and Z-shaped sheet piles has the potential to produce a permanent shift in the ability of seals and harbor porpoise to hear, resulting in Level A (Permanent Threshold Shift [PTS] onset) harassment. Level A (PTS onset) harassment will be minimized to the extent practicable given the methods of installation and measures designed to minimize the possibility of injury to marine mammals that are presented below.

- Steel sheet piles will primarily be installed with a vibratory pile driver. Vibratory pile drivers havee relatively low sound levels (<180 dB re 1 µPa at 10 m) and are not expected to cause injury toe marine mammals.e
- All pile driving will either not start or be halted if marine mammals approach the "shutdowne zone". The shutdown zone will be the Level A (PTS onset) harassment zone where the Level Ae (PTS onset) harassment zone is less than or equal to 150 meters. For those activities with largere Level A (PTS onset) harassment zones, the shutdown zone would be limited to 150 meters frome the point of noise generation to ensure adequate monitoring for each bulkhead section. Thise limit was suggested by NMFS for previous Navy projects in New England (Navy, 2019). Thee remaining area would be considered part of the disturbance zone.e
- A "take" will be recorded if a marine mammal enters the "disturbance zone" but does note approach or enter the shutdown zone. The disturbance zone is the Level B (behavioral)e harassment zone and, where present, the Level A (PTS onset) harassment zone beyond 150e meters from the point of noise generation. Work will be allowed to proceed without cessatione while marine mammals are in the disturbance zone and marine mammal behavior within thee disturbance zone will be monitored and documented. The largest Level B (behavioral) ZOI ande the Level A (PTS onset) ZOI beyond 150 meters would be monitored for each bulkhead sectione during pile driving activities to be protective of marine mammals regardless of what activity ise occurring.e
- Impact pile driving activities would utilize a "soft start" to allow sensitive species to move awaye from the noise source before the commencement of pile driving.e
- All pile driving activities would occur during daylight hours.e

Bulkhead repair/replacement is not anticipated to affect the prey base or significantly affect other habitat features of marine mammals that would meet the definition of take. See Chapter 11 for more details on the impact reduction and mitigation measures proposed.

Based on estimates of sound source levels and underwater acoustic transmission loss, the Navy has

identified the areas surrounding sound producing activities within which sound levels would result in Level A (PTS onset) harassment and Level B (behavioral) harassment (Refer to Chapter 6). The Navy proposes to monitor these areas during activities that produce sound levels that could result in marine mammal harassment. If a marine mammal enters the disturbance zone, it will be noted as a take authorized in the LOA. Sound producing activities will cease when a marine mammal enters the shutdown zone to prevent a prolonged exposure to sound that could reach the threshold for the onset of PTS. While the Navy believes this procedure will minimize the likelihood of Level A (PTS onset) acoustic exposures, it is possible that an animal could be present undetected within the Level A (PTS onset) ZOI during impact pile driving. Therefore, the Navy requests authorization for potential Level A (PTS onset) takes associated with this activity. A standard shutdown zone of 10 m (33 ft) will also be applied to prevent non-acoustic injury to marine mammals from all potentially hazardous in-water activities occurring in the project area.

For vibratory pile driving activities, the potential for Level A harassment by acoustic injury for seals extends less than 10 m from the source, and for these activities, the shutdown zone automatically mitigates/minimizes Level A acoustic harassment. Table 5-2 summarizes the shutdown zone distances for each proposed activity under each potential construction scenario.

Table 5-2 Shutdown Zone Distances by Activity

Pile type, Size, and Driving method, Location	*Shutdown Distance*	
	Porpoise and Dolphin	Seals
Year 1 (S45)		
Vibratory drive 22.5-inch, Z-shaped sheet piles	25 meters	10 meters
Impact drive 22.5-inch, Z-shaped sheet piles	150* meters	150* meters
Vibratory driving of 14" H-piles	11 meters	5 meters
Impact Drive 30-inch steel pipe pile	150* meters	150* meters
Year 2 (S366)		
Vibratory drive 22.5-inch, Z-shaped sheet piles	25 meters	10 meters
Impact drive 22.5-inch, Z-shaped sheet piles	150* meters	150* meters
Vibratory driving of 14" H-piles	11 meters	5 meters
Impact Drive 30-inch steel pipe pile	150* meters	150* meters
Year 2 (Pier 01)		
Vibratory drive 22.5-inch, Z-shaped sheet piles	25 meters	10 meters
Impact drive 22.5-inch, Z-shaped sheet piles	150* meters	150* meters
Vibratory driving of 14" H-piles	11 meters	5 meters
Year 3 (LNG)		
Vibratory drive 22.5-inch, Z-shaped sheet piles	25 meters	10 meters
Impact drive 22.5-inch, Z-shaped sheet piles	150* meters	150* meters
Vibratory driving of 14" H-piles	11 meters	5 meters
Year 4 (S499/Pier 2)		
Vibratory drive 31.5-inch, Z-shaped sheet piles	20 meters	10 meters
Impact drive 31.5-inch, Z-shaped sheet piles	150* meters	150* meters
Vibratory driving of 14" H-piles	11 meters	5 meters
Impact Drive 42-inch steel pipe pile	150* meters	150* meters

Note: *=Distance previously suggested by NMFS for other Navy projects in New England.

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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.

6.1 Introduction

The NMFS application for a LOA requires applicants to determine the number of marine mammals that are expected to be incidentally harassed by an action and the nature of the harassment (Level A [PTS onset] or Level B [behavioral]). Section 5 defines MMPA Level A (PTS onset) and Level B (behavioral) harassment. This section presents how these definitions informed the quantitative acoustic analysis methodologies used to assess the potential for the Proposed Action to affect marine mammals during each year of activities.

The Proposed Action has the potential to take marine mammals by harassment from noise produced by in-water pile driving. The potential of physical injury would be minimized with the implementation of marine mammal monitoring and shutdown procedures (see Section 11). Other construction activities (i.e. dredging, upland construction, stormwater improvements) are not expected to result in takes as defined under the MMPA. These activities would occur throughout the project duration. At this time, pile driving activities are anticipated to take approximately 4 years to complete. However, because the proposed repairs are dependent of the allocation of funding, the Navy is requesting that the LOA be issued for the entire 5-year construction period to ensure flexibility in the project schedule.

In-water pile driving will temporarily increase the local underwater and airborne noise environment near the proposed project area. Research suggests that increased noise may impact marine mammals in several ways and depends on many factors. This is discussed in more detail in Chapter 7. 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 physiology and behavior of that marine mammal. 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 significance of responses by marine mammals to sound exposures (Nowacek et al., 2007; Southall et al., 2007, 2019). Furthermore, many other factors besides 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.

Vibratory pile driving described in Chapter 1 of this application is not expected to result in Level A (PTS onset) exposure of marine mammals as defined under the MMPA but the noise-related impacts discussed in this application may result in Level B (behavioral) harassment. Impact pile driving could result in Level A (PTS onset) and Level B (behavioral) exposure of marine mammals as defined under the MMPA. The methods for estimating the number and types of exposure are summarized below.

Exposure of each species was determined by:

- Estimating the area of impact where noise levels exceed acoustic thresholds for marine mammals (Sections 6.7 and 6.8).
- Evaluating potential presence of each species at NAVSTA Newport based on site-specific surveys

and monitoring as outlined in Section 3 and 4.

- Estimating potential harassment exposures by multiplying the density or site-specifics abundance, as applicable, of each marine mammal species calculated in the area of impact bys their probable duration during construction (Section 6.12).

Each of the three items above is discussed in the following sections.

6.2 Description of Noise Sources

Ambient sound is a composite of sounds from multiple sources, including environmental events, biological sources, and anthropogenic activities. Physical noise sources include waves at the surface, precipitation, earthquakes, ice, and atmospheric noise, among other events. Biological sources include marine mammals, fish, and invertebrates. Anthropogenic sounds are produced by vessels (small and large), dredging, aircraft overflights, and construction activities. Known noise levels and frequency ranges associated with anthropogenic sources similar to those that would be used for this project are summarized in Table 6-1. Details of each of the sources are described in the following text.

Table 6-1 Representative Levels of Underwater Anthropogenic Noise Sources

Noise Source	*Frequency Range (Hz)*	*Source Level*	*Reference*
Dredging	1-500s	161–186 dB RMSs re 1 µPa at 1 ms	Richardson et al., 1995; DEFRA, 2003; Reine et al., 2014
Small vessels	860–8,000s	141–175 dB RMSs re 1 µPa at 1 ms	Galli et al., 2003; Matzner and Jones, 2011; Sebastianutto et al., 2011
Large ship	20-1,000s	176–186 dBs re 1 µPa²s SEL at 1 ms	McKenna, 2011
Tug docking gravel barge	200–1,000s	149 dB RMS at 100 ms	Blackwell and Greene, 2002

Legend: dB = decibel; Hz = hertz; m = meter; re 1 µPa = reference at 1 micropascal; re 1 µPa² = reference at 1 micropascal squared second; RMS = root mean square; SEL = sound exposure level; sec = second

In-water construction activities associated with the Proposed Action include impact and vibratory pile driving. The sounds produced by these activities fall into two sound types: impulsive and non-impulsive (defined below). Impact pile driving produces impulsive sounds, while vibratory pile driving produces non-impulsive sounds. The distinction between these two general sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (Ward, 1997).

Impulsive sounds (e.g., explosions, seismic air gun pulses, and impact pile driving), which are referred to as pulsed sounds in Southall et al. (2007, 2019), are brief, broadband, atonal transients (Harris, 1998) and occur either as isolated events or repeated in some succession (Southall et al., 2007, 2019). Impulsive sounds are characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a decay period that may include a period of diminishing, oscillating maximal and minimal pressures (Southall et al., 2007). Impulsive sounds generally have a greater capacity to induce physical injury compared with sounds that lack these features (Southall et al., 2007, 2019).

Non-impulsive sounds (referred to as non-pulsed in Southall et al., 2007) can be tonal, broadband, or both. They lack the rapid rise time and can have longer durations than impulsive sounds. Non-impulsive sounds can be either intermittent or continuous. Examples of non-impulsive sounds include vessels, aircraft, and machinery operations such as drilling, dredging, and vibratory pile driving (Southall et al.,

2007). In some environments, the duration of both impulsive and non-impulsive sounds can be extended due to reverberations.

6.3 Vocalizations and Hearing of Marine Mammals

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

For animals not available in captive or stranded settings (including large whales and rare species), estimates of hearing capabilities are based on anatomical and physiological structures, the frequency range of the species' vocalizations, and extrapolations from related species.

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

The NMFS reviewed studies of hearing sensitivity of marine mammals and developed thresholds for use as guidance when assessing the effects of anthropogenic sound on marine mammals based on measured or estimated hearing ranges (NMFS, 2018a). The guidance places marine mammals into the following functional hearing groups based on their generalized hearing sensitivities: high-frequency cetaceans, mid-frequency cetaceans, low-frequency cetaceans (mysticetes), otariid pinnipeds (sea lions and fur seals), and phocid pinnipeds (true seals). Research is underway to subdivide these hearing groups in the future (Southall et al., 2019). Table 6-2 provides sound production and hearing capabilities for marine mammal species that are assessed in this application. There are no low-frequency cetaceans or otariid pinnipeds included in this application (refer to Chapter 3).

Table 6-2 Hearing and Vocalization Ranges for Marine Mammal Functional Hearing Groups and Species in Narragansett Bay

Functional Hearing Group	*Species*	*Functional Hearing Range*[1]
Mid-frequency cetaceans	Atlantic white-sided dolphin, short-beaked common dolphin	150 Hz to 160 kHz
High-frequency cetaceans	Harbor porpoise	275 Hz to 160 kHz
Phocidae	Harbor seal, gray seal, harp seal, hooded seal	In-water: 50 Hz to 86 kHz In-air: 75 Hz to 30 kHz

Legend: Hz = Hertz; kHz = kilohertz

Note: [1]In-water hearing data from NMFS, 2018a; in-air data from Schusterman, 1981; Hemilä et al., 2006; Southall et al., 2007, 2019.

6.4 Sound Exposure Criteria and Thresholds

Currently, the NMFS uses underwater sound exposure thresholds to determine when an activity could result in impacts to a marine mammal defined as Level A (PTS onset) (NMFS, 2018a) or Level B (behavioral) harassment (NMFS, 2005) (Table 6-3). The NMFS (2018a) has recently developed acoustic threshold levels for determining the onset of PTS in marine mammals in response to underwater impulsive and non-impulsive sound sources. The criteria use a cumulative sound exposure level (SEL_{cum}) in units of dB referenced at 1 micropascal squared second (re 1 μPa^2sec) and peak sound pressure level (SPL) in dB (dB PEAK) referenced at 1 micropascal (re 1 µPa). The NMFS equates the onset of PTS, which is a form of auditory injury, with Level A harassment under the MMPA. Level B (behavioral) harassment occurs when marine mammals are exposed to impulsive underwater sounds above 160 dB RMS re 1 µPa, such as from impact pile driving, and to non-impulsive underwater sounds above 120 dB RMS re 1 µPa, such as from vibratory pile driving (NMFS, 2005). The onset of TTS is a form of Level B (behavioral) harassment under the MMPA and "harassment" under the ESA. All forms of harassment, either auditory or behavioral, constitute "incidental take" under these statutes.

The NMFS uses generic sound exposure thresholds to determine when an activity that produces airborne sound might result in impacts to a marine mammal (70 Federal Register [FR] 1871). Construction period airborne noise would have little impact to cetaceans because noise from airborne sources would not transmit as well underwater (Richardson et al., 1995); thus, noise would primarily be a problem for hauled out pinnipeds near the project location. NMFS has identified behavioral harassment threshold criteria for airborne noise generated by pile driving for pinnipeds regulated under the MMPA. Level A (PTS onset) threshold criteria for airborne noise have not been established. The Level B (behavioral) harassment threshold for harbor seals is 90 dB RMS referenced to 20 micro pascals (re 20 µPa) (unweighted) and for other pinnipeds except harbor seals is 100 dB RMS re 20 µPa (unweighted).

Table 6-2 Injury and Disturbance Threshold Criteria for Underwater and Airborne Noise

Marine Mammals	*Airborne Noise (impact and vibratory pile driving)* [1]	*Underwater Vibratory Pile Driving Noise (non-impulsive sounds)*		*Underwater Impact Pile Driving Noise (impulsive sounds)*	
	Disturbance Guideline (haul out)[2]	*Level A (PTS Onset) Threshold*	*Level B (Behavioral) Threshold*	*Level A (PTS Onset) Threshold*[3]	*Level B (Behavioral) Threshold*
Mid-Frequency Cetaceans	Not applicable	198 dB SEL_{CUM}[4]	120 dB RMS	230 dB Peak[5] 185 dB SEL_{CUM}[4]	160 dB RMS
High-Frequency Cetaceans	Not applicable	173 dB SEL_{CUM}[4]	120 dB RMS	202 dB Peak[5] 155 dB SEL_{CUM}[4]	160 dB RMS
Phocidae (true seals)	90 dB RMS (harbor seals) 100 dB RMS (gray seals, harp seals, hooded seals) (unweighted)	201 dB SEL_{CUM}[4]	120 dB RMS	218 dB Peak[5] 185 dB SEL_{CUM}[4]	160 dB RMS

Legend: µPa = micropascal; dB = decibel; PTS = permanent threshold shift; RMS = root mean square; SEL = sound exposure level.

Notes: [1]Airborne disturbance thresholds not specific to pile driver type.

[2]Sound level at which pinniped haul out disturbance has been documented. This is not considered an official threshold but is used as a guideline.

[3]Dual metric acoustic thresholds for impulsive sounds. Whichever results in the largest isopleth for calculating PTS onset is used in the analysis.

[4]Cumulative SEL over 24 hours.

[5]Flat weighted or unweighted peak sound pressure within the generalized hearing range.

6.5 Limitations of Existing Noise Criteria

The application of the 120 dB RMS re 1 µPa behavioral threshold can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations. The 120 dB RMS re 1 µPa threshold level for non-impulsive noise originated from research conducted by Malme et al. (1984, 1988) for California gray whale response to continuous industrial sounds such as drilling operations.

To date, there is little research or data supporting a response by pinnipeds or odontocetes to non-impulsive sounds from vibratory pile driving as low as the 120 dB threshold. The threshold is based on indirect evidence from studies of gray whale responses to playbacks of industrial noise conducted in the 1980s (NMFS, 2018a). Southall et al. (2007) reviewed studies conducted to document behavioral responses of harbor seals and northern elephant seals to non-impulsive sounds under various conditions and concluded that those limited studies suggest that exposures between 90 dB and 140 dB RMS re 1 µPa generally do not appear to induce strong behavioral responses. A more recent observational study found evidence of weak but statistically significant avoidance behavior of bottlenose dolphins (*Tursiops truncatus*) and harbor porpoises in response to estimated received levels of 99-132 dB re 1µPa^{2}s during vibratory pile driving (Graham et al., 2017). Branstetter et al. (2018) tested for the effects of vibratory pile driver noise on bottlenose dolphin echolocation by exposing penned dolphins to play back recordings at source levels of 110, 120, 130, and 140 dB re 1µPa, respectively. They found evidence of altered behavior (an almost complete cessation of echolocation clicks) only at the highest source level, for which the received level was roughly estimated as 128 dB re 1µPa. The effect on behavior diminished significantly, indicating acclimation, as the animals resumed echolocation during subsequent replications.

6.6 Auditory Masking

Natural and artificial sounds can disrupt behavior through auditory masking or interference with a marine mammal's ability to detect and interpret other relevant sounds, such as communication and echolocation signals (Wartzok et al., 2004). Masking occurs when both the signal and masking sound have similar frequencies and either overlap or occur very close to each other in time. A signal is very likely to be masked if the noise is within a certain "critical bandwidth" around the signal's frequency and its energy level is similar or higher (Holt, 2008). Noise within the critical band of a marine mammal signal will show increased interference with detection of the signal as the level of the noise increases (Wartzok et al., 2004). For example, in delphinid subjects, relevant signals needed to be 17 to 20 dB louder than masking noise at frequencies below 1 kHz to be detected and 40 dB greater at approximately 100 kHz (Richardson et al., 1995). Noise at frequencies outside of a signal's critical bandwidth will have little to no effect on the detection of that signal (Wartzok et al., 2004).

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

Masking noise from anthropogenic sources could cause behavioral changes if it disrupts communication, echolocation, or other hearing-dependent behaviors. As noted above, noise frequency and amplitude both contribute to the potential for vocalization masking. Noise from pile driving typically covers a frequency range with most of the acoustic energy below 2 kHz (Dahl et al., 2015), which is likely to overlap the frequencies of vocalizations produced by species that may occur in the proposed project area. Amplitude of noise from both impact and vibratory pile driving methods is variable and may exceed that of marine mammal vocalizations within an unknown range of each incident pile. Depending on the animal's location and vocalization source level, this range may vary over time.

Although SPLs from impact pile driving are greater, the zone of potential masking effects from vibratory pile driving may be as large or larger due to the duration and continuous nature of vibratory pile driving. The potential for masking differs between species, depending on the overlap between pile driving noise and the animals' hearing and vocalization frequencies. In this respect, harbor porpoises, which use high-frequency sound, and dolphins (Atlantic white-sided and short-beaked) which use mid-frequency sound, are probably less vulnerable to masking from pile driving than are seals. In addition, harbor porpoise or dolphin species that may be subject to masking are transitory within the vicinity of the proposed project area. The animals most likely to be at risk for vocalization masking are resident pinnipeds (harbor seals around local haul out areas and occasional presence of gray seals, harp seals, and hooded seals). Possible behavioral reactions to vocalization masking include changes to vocal behavior (including cessation of calling), habitat abandonment (long- or short-term), and modifications to the acoustic structure of vocalizations (i.e., amplitude, frequency, duration, or repetition rate) which may help signalers compensate for masking (Brumm and Slabbekoorn, 2005; Brumm and Zollinger, 2011). The extent to which the animals' behaviors would mitigate the potential for masking is uncertain, and, accordingly, the Navy has estimated that masking as well as compensatory behavioral responses are

likely within the zones of behavioral harassment estimated for vibratory and impact pile driving.

6.7 Modeling Potential Noise Impacts from Pile Driving

6.7.1 Underwater Sound Propagation

Pile driving will generate underwater noise that potentially could result in harassment to marine mammals swimming by the proposed project area. Transmission loss (TL) underwater is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source until the source becomes indistinguishable from ambient sound. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. A "Practical Spreading" value of 15 (referred to as "practical spreading loss") is widely used for intermediate or spatially varying conditions when actual values for transmission loss are unknown. This value was used to model the estimated range from pile driving activity to various expected SPLs at potential project structures. This model follows a geometric propagation loss based on the distance from the driven pile, resulting in a 4.5 dB reduction in level for each doubling of distance from the source. In this model, the SPL at some distance away from the source (e.g., driven pile) is governed by a measured source level, minus the TL of the energy as it dissipates with distance. The TL equation is:

$$TL = 15 \log_{10}\left(\frac{R_1}{R_2}\right)$$

Where:

TL is the transmission loss in dB,

R_1 is the distance of the modeled SPL from the driven pile, and

R_2 is the distance (usually 10 m) from the driven pile of the initial measurement.

The degree to which underwater noise propagates away from a noise source is dependent on a variety of factors, most notably by bathymetry and the presence or absence of reflective or absorptive conditions, including the water surface and sediment type. The TL model described above was used to calculate the expected noise propagation from both impact and vibratory pile driving using representative source levels to estimate the ZOI or area exceeding the noise criteria. The extent of representative maximum ZOIs depicted in Figures 6-1 through 6-4 are based on the pile location at each bulkhead section with the greatest anticipated noise propagation.

6.7.2 Underwater Noise from Pile Driving

The intensity of pile driving sound is greatly influenced by factors such as the type of piles, type of driver, and the physical environment in which the activity takes place. To estimate sound source levels for the proposed construction elements, acoustic monitoring results and associated monitoring reports from past projects conducted at NAVTSA Newport and other Navy installations were reviewed. Projects reviewed were similar to the Proposed Action in terms of construction activities, type and size of piles installed, method of pile installation, and substrate conditions. The representative SPLs used in the analysis are presented in Table 6-4.

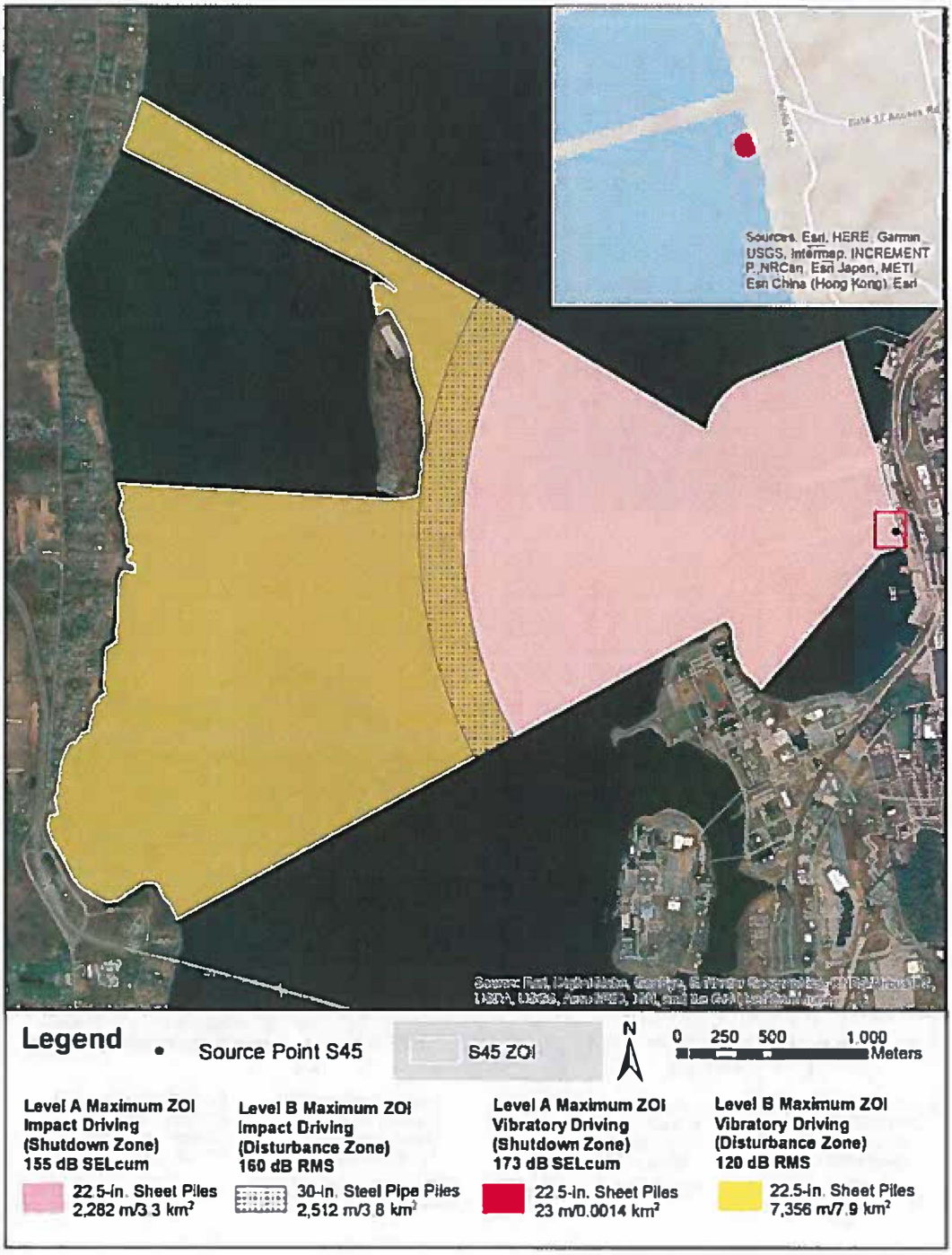


Figure 6-1 Representative Maximum Level A (PTS onset) and Level B (Behavioral) ZOIs for Year 1 Pile Driving Activity

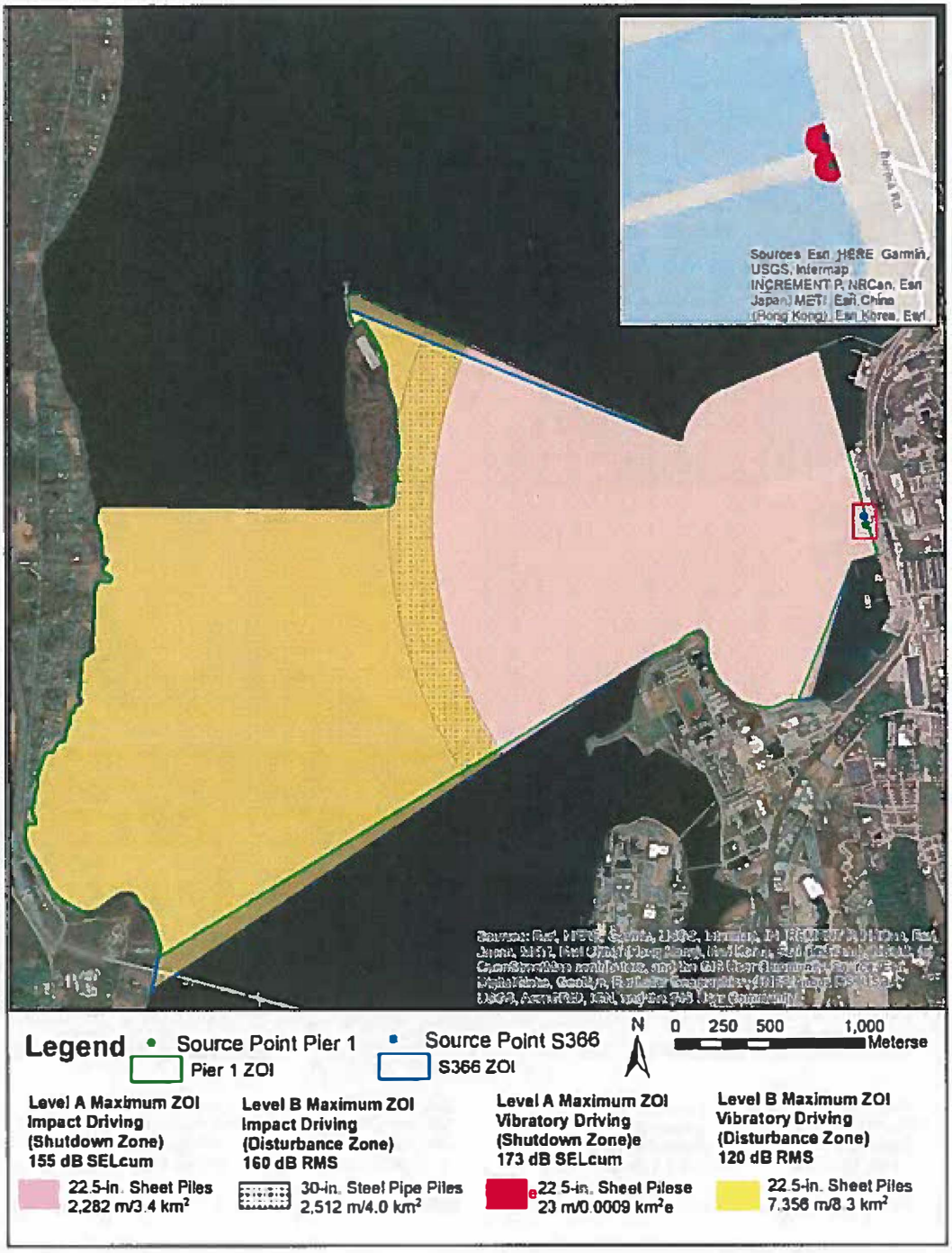
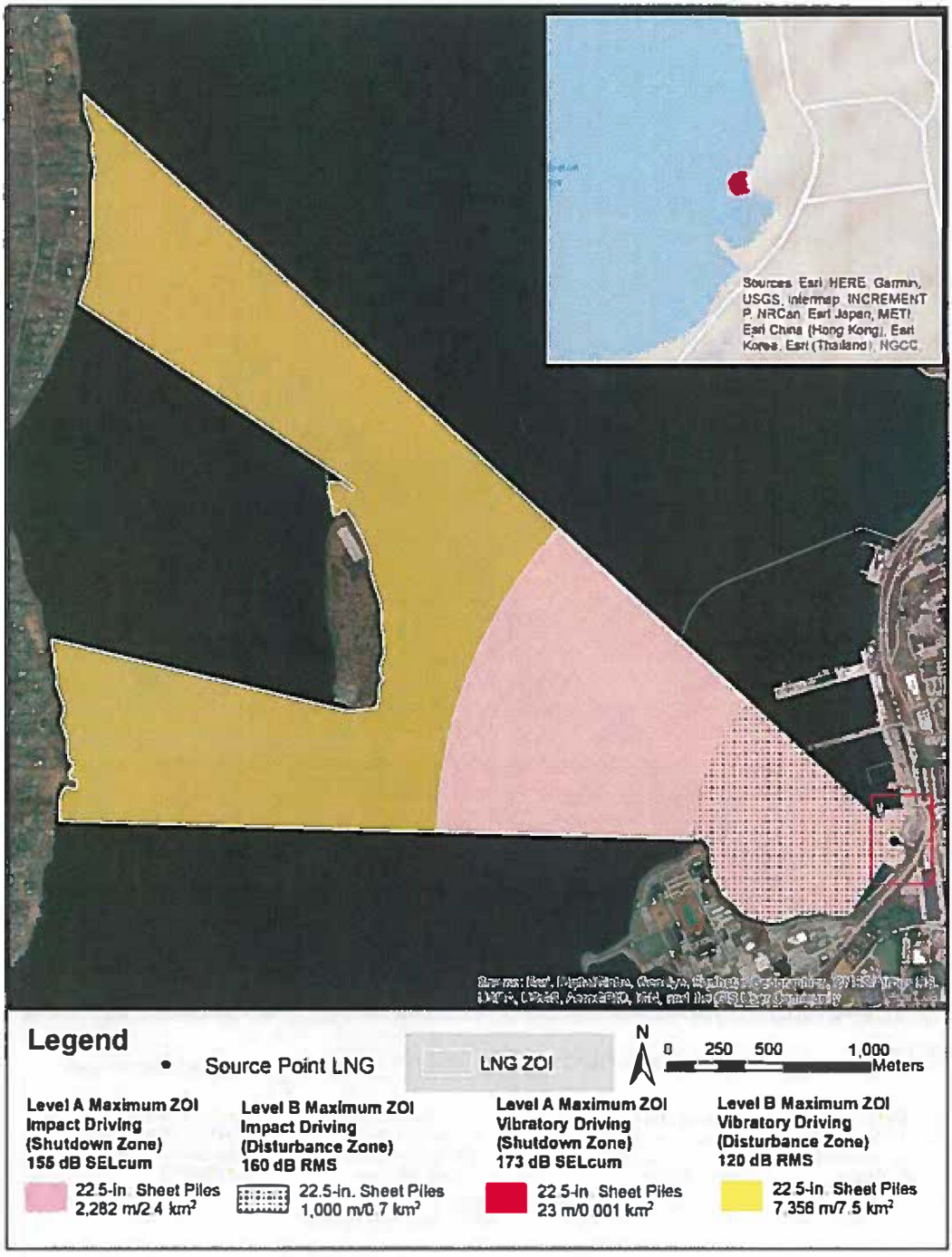


Figure 6-2 Representative Maximum Level A (PTS onset) and Level B (Behavioral) ZOIs for Year 2 Pile Driving Activity



Note: Level A distances exceed Level B distances because Level A threshold distances are calculated using auditory weighting functions and weighting factor adjustments, whereas Level B threshold distances are calculated using a transmission loss model.

Figure 6-3 Representative Maximum Level A (PTS Onset) and Level B (Behavioral) ZOIs for Year 3 Pile Driving Activity

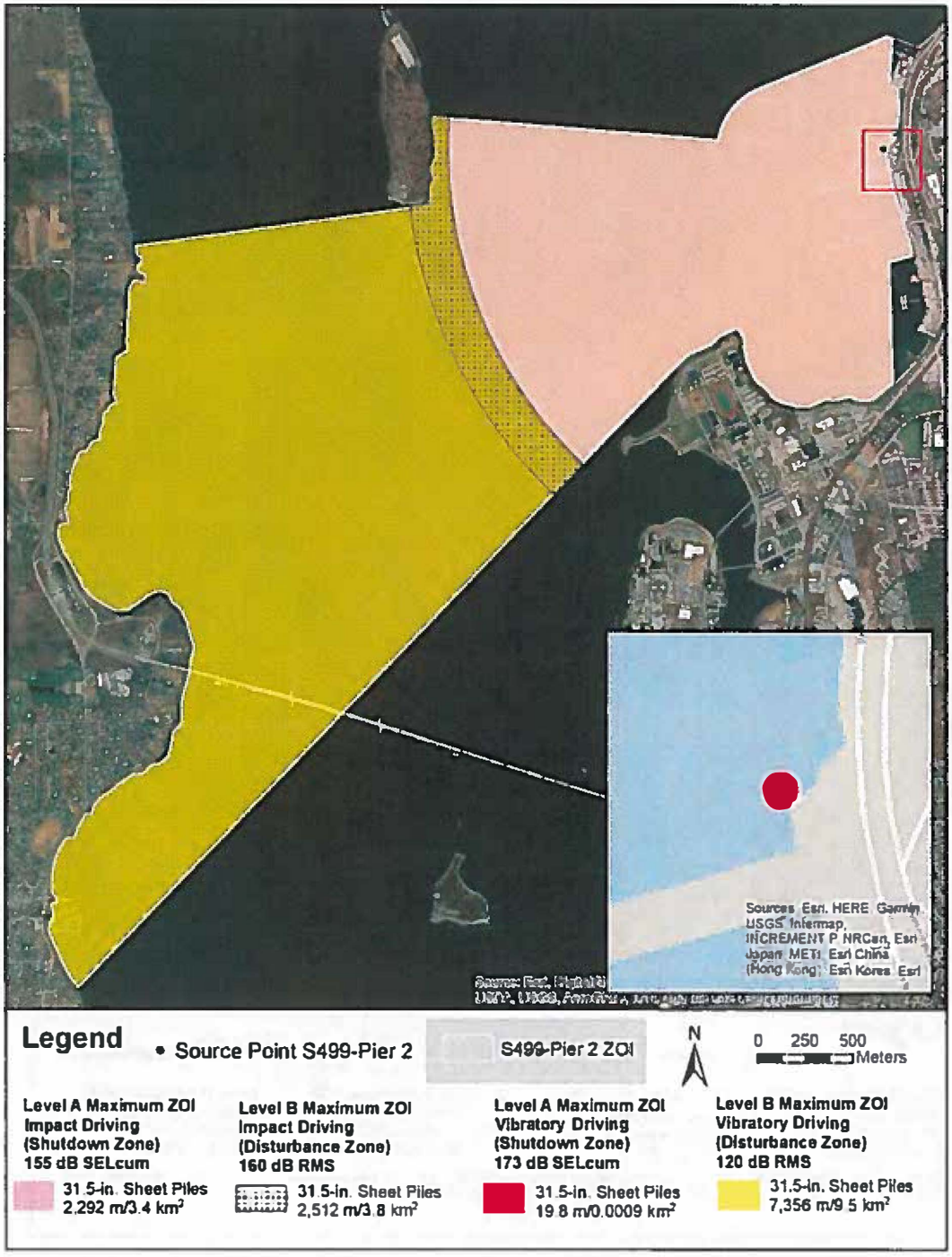


Figure 6-4 Representative Maximum Level A (PTS Onset) and Level B (Behavioral) ZOIs for Year 4 Pile Driving Activity

Table 6-3 Underwater Noise Source Levels Modeled for Impact and Vibratory Pile Driving

Pile Size, Type	*Method*	*Sound Pressure Levels (SPL) or Sound Exposure Level (SEL) at 10 meters distance*		
		Average Peak SPL, dB re 1 µPa	*Average Root Mean Square SPL, dB re 1 µPa*	*Average SEL, dB re 1 µPa²-sec*
42-inch Diameter Steel Pipe[1]	Impact	213	190	177
30-inch Diameter Steel Pipe[2]	Impact	211	196	181
14-inch Steel H-pile[3]	Vibratory	NA	158	158
31.5-inch Z-shaped Steel Sheet[2]	Impact	211	196	181
31.5-inch Z-shaped Steel Sheet[3]	Vibratory	NA	163	163
22.5-inch Z-shaped Steel Sheet[3]	Impact[4]	205	190	180
22.5-inch Z-shaped Steel Sheet[3]	Vibratory[5]	NA	163	163

Legend: All sound pressure levels (SPLs) are unattenuated; dB=decibels; rms = root mean square, SEL = sound exposure level; NA = Not applicable; NR = Not reported; dB re 1 µPa = dB referenced to a pressure of 1 microPascal, measures underwater SPL. dB re 1 µPa²-sec = dB referenced to a pressure of 1 microPascal squared per second. Single strike SEL are the proxy source levels presented for impact pile driving and are used to calculate distances to permanent threshold shift (PTS).

Notes
[1] = Navy 2015.
[2] = NAVFAC SW 2018.
[3] = Navy 2019.
[4] = Proxy values are maximum values.
[5] =24-inch sheets were used as a proxy for the 22.5-inch piles.

For the analyses that follow, the TL model described above was used to calculate the expected noise propagation from pile driving. For vibratory and impact behavioral zones and peak injury zones, a representative source level (Table 6-4) was used to estimate the area exceeding the noise criteria. The Technical Guidance (NMFS, 2018a) provides Level A (PTS onset) thresholds and auditory weighting functions for each marine mammal hearing group, whereas the Spreadsheet contains default weighting factor adjustments (WFAs) for different types of broadband sources (NMFS, 2018b). The WFAs assign a single frequency to represent the sound spectrum of the source, approximating what the animal is exposed to. The WFA frequency, when applied to the auditory weighting function of the group, determines what adjustment is made to the source level prior to calculating the threshold distance. To calculate the maximum distances to Level A (PTS onset) thresholds associated with each particular source, NMFS' (2018a) Technical Guidance was followed and the Optional User Spreadsheet (NMFS, 2018b) was used. See Appendix A for calculated distances to Level A (PTS onset) thresholds.

6.8 Distance to Underwater Sound Thresholds

Calculated distances to the underwater marine mammal auditory (PTS onset) SEL thresholds and behavioral thresholds for the three hearing groups are provided in Tables 6-5 through 6-8 for vibratory and impact pile driving activities by construction year. Calculated distances to Level A (PTS onset) and Level B (behavioral) thresholds are large but do not take into account attenuation from intersecting land masses, which would reduce the overall area of potential impact to the ROI provided in Figure 1-3. Level A (PTS onset) and Level B (behavioral) thresholds have the potential to be exceeded within the entire ROI.

Adjusted maximum distances are provided for the behavioral thresholds where the extent of noise reaches land prior to reaching the calculated radial distance to the threshold. Areas encompassed within

the threshold (ZOI) were calculated using the location of a representative pile. Sound source locations were chosen to model the greatest possible affected areas.

The maximum distance to Level A (PTS onset) during construction years 1 through 3 would be during the impact driving of 22.5-inch (3.75-ft pair) Z-shaped sheet piles (2,282 meters for harbor porpoise and 1,025 meters for seals) (Tables 6-5 through 6-7; Figure 6-1 through 6-3). The maximum distance to Level A (PTS onset) during construction year 4 would be during the impact driving of 31.5-inch (5.25 ft pair) Z-shaped sheet piles (2,292 meters for harbor porpoise and 1,030 meters for seals) (Tables 6-8; Figure 6-4).

The furthest extent to Level B (behavioral) harassment threshold during construction years 1 through 4 would be a distance of 7,356 meters resulting from the vibratory installation of sheet piles (Table 6-5 through 6-8; Figures 6-1 through 6-4). However, this distance will be truncated due to the presence of intersecting land masses. The number and species of marine mammals anticipated to be taken by pile driving activities during construction years 1 through 4 is presented in Section 6.13.

Table 6-5 Calculated Maximum Distances Corresponding to MMPA Thresholds for Underwater Sound from Year 1 Construction Activities

Impulsive								
Year	*Section*	*Pile Quantity*	*Pile Size and Type*	*Total Pile Driving Days*	*Level A (PTS Onset) Harassment*			*Level B (Behavioral) Harassment*
					High-Frequency Cetaceans (Harbor Porpoise) 155 dB SEL_{cum} Threshold/Area	*Mid-Frequency Cetaceans (Dolphins) 185 dB SEL_{cum} Threshold/Area*	*Phocid Pinnipeds (Seals) 185 dB SEL_{cum} Threshold/Area*	*All Marine Mammals 160 dB RMS Threshold/Area*
1	S45	80 pair	3.75-ft (pair) Z-shapede sheets (22.5-inch each)e	27	2,282 m/3.3 km^2 [1]	68 m/0.009 km^2	1,025 m/1.15 km^2	1,000 m/1.1 km^2
1	S45	4	30-inch steel pipee	4	910 m/0.9 km^2	27 m/0.002 km^2	409 m/0.2 km^2	2,512 m/3.8 km^2
Non-Impulsive								
Year	*Section*	*Pile Quantity*	*Pile Size and Type*	*Total Pile Driving Days*	*Level A (PTS Onset) Harassment*			*Level B (Behavioral) Harassment*
					High-Frequency Cetaceans (Harbor Porpoise) 173 dB SEL_{cum} Threshold Distance/Area	*Mid-Frequency Cetaceans (Dolphins) 198 dB SELcum Threshold Distance/Area*	*Phocid Pinnipeds (Seals) 201 dB SELcum Threshold Distance/Area*	*All Marine Mammals 120 dB RMS Threshold Distance/Area*
1	S45	80 pair	3.75-ft (pair) Z-shapede sheets (22.5-inch each)e	27	23.0 m/0.0014 km^2	1.4 m/0.000006 km^2	9.4 m/0.0003 km2	7,356 m/7.9 km2
1	545	76	14-inch Steel H-pilee	13	10.1 m/0.0003 km2	0.6 m/0.000001 km2	4.2 m/0.00006 km2	3,415 m/5.6 km2

Legend: km^2=square kilometers; m=meters.e

Notes: * = To determine underwater ZOIs, radial distances from the source will be clipped along the shoreline using GIS.

[1] = Level A (PTS onset) distances exceed Level B (behavioral) distances for harbor porpoise because Level A (PTS onset) threshold distances aree calculated using auditory weighting functions and weighting factor adjustments, whereas Level B (behavioral) threshold distances are calculated using a transmission loss model. Proxy sources used were unattenuated SPLs; Level B (behavioral) threshold applies to all marine mammals.

Source: NAVSTA Newport, 2019.

Table 6-6 Calculated Maximum Distances Corresponding to MMPA Thresholds for Underwater Sound from Year 2 Construction Activities

Impulsive								
					Level A (PTS Onset) Harassment			*Level B (Behavioral) Harassment*
Year	*Section*	*Pile Quantity*	*Pile Size and Type*	*Total Pile Driving Days*	*High-Frequency Cetaceans (Harbor Porpoise) 155 dB SELcum Threshold Distance/Area*	*Mid-Frequency Cetaceans (Dolphins) 185 dB SELcum Threshold Distance/Area*	*Phocid Pinnipeds (Seals) 185 dB SELcum Threshold Distance/Area*	*All Marine Mammals 160 dB RMS Threshold Distance/Area*
2	S366	14 pair	3.75-ft (pair) Z-shaped sheets (22.5-inch each)	5	2,282 m/3.4 km^2 [1]	68 m/0.008 km^2	1,025 m/1.3 km^2	1,000 m/1.3 km^2
2	S366	15	30-inch diameter Steel pipe	15	910 m/1.1 km^2	27 m/0.001 km2	409 m/0.2 km^2	2,512 m/4.0 km^2
2	Pier 1	27 pair	3.75-ft (pair) Z-shapede sheets (22.5-inch each)e	9	2,282 m/3.4 km^2 [1]	68 m/0.008 km^2	1,025 m/1.3 km^2	1,000 m/1. 3 km^2
Non-Impulsive								
					Level A (PTS Onset) Harassment			*Level B (Behavioral) Harassment*
Year	*Section*	*Pile Quantity*	*Pile Size and Type*	*Total Pile Driving Days*	*High-Frequency Cetaceans (Harbor Porpoise) 173 dB SELcum Threshold Distance/Area*	*Mid-Frequency Cetaceans (Dolphins) 198 dB SELcum Threshold Distance/Area*	*Phocid Pinnipeds (Seals) 201 dB SELcum Threshold Distance/Area*	*All Marine Mammals 120 dB RMS Threshold Distance/Area*
2	S366	14 pair	3.75-ft (pair) Z-shaped sheets (22.5-inch each)	5	23.0 m/0.0009 km^2	1.4 m/0.000005 km^2	9.4 m/0.0002 km^2	7,356 m/8.3 km^2
2	S366	14	14-inch Steel H-pilee	3	10.1 m/0.0002 km^2	0.6 m/0.000001 km^2	4.2 m/0.00003 km^2	3,415 m/5.8 km^2
2	Pier 1	27 pair	3.75-ft (pair) Z-shapede sheets (22.5-inch each)e	9	23.0 m/0.0009 km^2	1.4 m/0.000005 km^2	9.4 m/0.0002 km^2	7,356 m/8.3 km^2
2	Pier 1	26	14-inch Steel H-pilee	5	10.1 m/0.0002 km^2	0.6 m/0.000001 km^2	4.2 m/0.00003 km^2	3,415 m/5.8 km^2

Legend: km^2=square kilometers; m=meters.e

Notes: * = To determine underwater ZOIs, radial distances from the source will be clipped along the shoreline using GIS.e

[1] = Level A (PTS onset) distances exceed Level B (behavioral) distances for harbor porpoise because Level A (PTS onset) threshold distances are calculated usinge auditory weighting functions and weighting factor adjustments, whereas Level B (behavioral) threshold distances are calculated using a transmission loss model. Proxy sources used were unattenuated SPLs; Level B (behavioral) threshold applies to all marine mammals.

Source: NAVSTA Newport, 2019.

Table 6-7 Calculated Maximum Distances Corresponding to MMPA Thresholds for Underwater Sound from Year 3 Construction Activities

Impulsive								
Year	*Section*	*Pile Quantity*	*Pile Size and Type*	*Total Pile Driving Days*	*Level A (PTS Onset) Harassment*			*Level B (Behavioral) Harassment*
					High-Frequency Cetaceans (Harbor Porpoise) 155 dB SEL_{cum} Threshold/Area	*Mid-Frequency Cetaceans (Atlantic White-Sided and Short-Beaked Common Dolphins) 185 dB SEL_{cum} Threshold/Area*	*Phocid Pinnipeds (Seals) 185 dB SEL_{cum} Threshold/Area*	*All Marine Mammals 160 dB RMS Threshold/Area*
3	LNG	173 pair	3.75-ft (pair) Z-shaped sheets (22.5-inch each)	58	2,282 m/2.4 km^2 [1]	68 m/0.01 km^2	1,025 m/0.7 km^2	1,000 m/0.7 km^2
Non-Impulsive								
Year	*Activity*	*Pile Quantity*	*Pile Size and Type*	*Total Pile Driving Days*	*Level A (PTS Onset) Harassment*			*Level B (Behavioral) Harassment*
					High-Frequency Cetaceans (Harbor Porpoise) 173 dB SEL_{cum} Threshold Distance/Area	*Mid-Frequency Cetaceans (Atlantic White-Sided and Short-Beaked Common Dolphin) 198 dB SELcum Threshold Distance/Area*	*Phocid Pinnipeds (Seals) 201 dB SELcum Threshold Distance/Area*	*All Marine Mammals 120 dB RMS Threshold Distance/Area*
3	LNG	173 pair	3.75-ft (pair) Z-shaped sheets (22.5-inch each)	58	23.0 m/0.001 km^2	1.4 m/0.000006 km^2	9.4 m/0.0002 km^2	7,356 m/7.5 km^2
3	LNG	164	14-inch Steel H-pile	28	10.1 m/0.0003 km^2	0.6 m/0.000001 km^2	4.2 m/0.00005 km^2	3,415 m/4.7 km^2

Legend: km^2=square kilometers; m=meters.

Notes: * = To determine underwater ZOIs, radial distances from the source will be clipped along the shoreline using GIS.

[1] = Level A (PTS onset) distances exceed Level B (behavioral) distances for harbor porpoise because Level A (PTS onset) threshold distances are calculated using auditory weighting functions and weighting factor adjustments, whereas Level B (behavioral) threshold distances are calculated using a transmission loss model. Proxy sources used were unattenuated SPLs; Level B (behavioral) threshold applies to all marine mammals.

Source: NAVSTA Newport, 2019.

Table 6-8 Calculated Maximum Distances Corresponding to MMPA Thresholds for Underwater Sound from Year 4 Construction Activities

Impulsive								
Year	*Section*	*Pile Quantity*	*Pile Size and Type*	*Total Pile Driving Days*	*Level A (PTS Onset) Harassment*			*Level B (Behavioral) Harassment*
					High-Frequency Cetaceans (Harbor Porpoise) 155 dB SEL_{cum} Threshold/Area	*Mid-Frequency Cetaceans (Atlantic White-Sided and Short-Beaked Common Dolphins) 185 dB SEL_{cum} Threshold/Area*	*Phocid Pinnipeds (Seals) 185 dB SEL_{cum} Threshold/Area*	*All Marine Mammals 160 dB RMS Threshold/Area*
4	S499/Pier 2	70 pair	5.25 ft (pair) Z-shaped sheets (31.5-inch each)	23	2,292 m/3.4 km^2	68 m/0.01 km^2	1,030 m/1.2 km^2	2,512 m/3.8 km^2
4	S499/Pier 2	35	42-inch diameter Steel pipe	18	782 m/0.9 km^2	23 m/0.001 km^2	351 m/0.2 km^2	1,000 m/1.2 km^2
Non-Impulsive								
Year	*Activity*	*Pile Quantity*	*Pile Size and Type*	*Total Pile Driving Days*	*Level A (PTS Onset) Harassment*			*Level B (Behavioral) Harassment*
					High-Frequency Cetaceans (Harbor Porpoise) 173 dB SEL_{cum} Threshold Distance/Area	*Mid-Frequency Cetaceans (Atlantic White-Sided and Short-Beaked Common Dolphin) 198 dB SELcum Threshold Distance/Area*	*Phocid Pinnipeds (Seals) 201 dB SELcum Threshold Distance/Area*	*All Marine Mammals 120 dB RMS Threshold Distance/Area*
4	S499/Pier 2	70 pair	3.75-ft (pair) Z-shaped sheets (22.5-inch each)	23	19.8 m/0.0009 km^2	1.2 m/0.000004 km^2	8.1 m/0.0002 km^2	7,356 m/9.5 km^2
4	S499/Pier 2	79	14-inch Steel H-pile	14	10.1 m/0.0002 km^2	0.6 m/0.000001 km^2	4.2 m/0.00005 km^2	3,415 m/5.7 km^2

Legend: km^2=square kilometers; m=meters.

Notes: * = To determine underwater ZOIs, radial distances from the source will be clipped along the shoreline using GIS.

[1] = Level A (PTS onset) distances exceed Level B (behavioral) distances for harbor porpoise because Level A (PTS onset) threshold distances are calculated using auditory weighting functions and weighting factor adjustments, whereas Level B (behavioral) threshold distances are calculated using a transmission loss model. Proxy sources used were unattenuated SPLs; Level B (behavioral) threshold applies to all marine mammals.

Source: NAVTSA Newport, 2019.

6.9 Distance to Airborne Sound Threshold

Pile driving can generate airborne noise that could potentially result in harassment to marine mammals (pinnipeds) that are hauled out or at the water's surface. As a result, the Navy analyzed the potential for pinnipeds hauled out or swimming at the surface to be exposed to airborne SPLs that could result in Level B (behavioral) harassment. The airborne noise threshold for behavioral harassment for all pinnipeds, except harbor seals, is 100 dB RMS re 20 µPa (unweighted) and for harbor seals is 90 dB RMS re 20 µPa (unweighted) (see Table 6-3). Construction noise behaves as point source and, thus, propagates in a spherical manner with a 6 dB decrease in SPL over water ("hard site" condition) per doubling of distance. The water surface is considered a hard site and acts as a reflective surface where it does not provide any attenuation (Washington Department of Transportation [WSDOT] 2019). A spherical spreading loss model, assuming average atmospheric conditions, was used to estimate the distance to the 100 dB and 90 dB RMS re 20 µPa (unweighted) airborne thresholds. The TL equation is:

$$TL = 20 \log_{10} \left(\frac{R_1}{R_2} \right)$$

Where:

TL is the transmission loss in dB,

R_1 is the distance of the modeled SPL from the driven pile, and

R_2 is the distance from the driven pile of the initial measurement.

The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. Sheet, pipe, and H-piles would be installed via impact and/or vibratory methods. Table 6-9 summarizes the airborne proxy source levels used for modeling distances to noise thresholds for pinniped (seal) haul out areas.

Table 6-9 Summary of Airborne Proxy Source Levels

Pile Size (diameter in inches)	*Impact*	*Vibratory*
	rms L_{max} (Unweighted)	*rms L_{eq} (Unweighted)*
42-inch Steel pipe[1]	98	NA
30-inch steel pipe[2]	110	NA
31.5-inch Z-shaped steel sheet[1]	87	85
22.5-inch Z-shaped steel sheet[3,4]	88	82
14-inch H-Pile[1]	*NA*	*74*

Notes: All values relative to dB re 20 µPa = dB referenced to a pressure of 20 microPascals at 15 meters (50-ft) (except where noted); rms = root mean square, L_{eq}= Equivalent continuous SPLs; L_{max}= rms maximum level of a noise. No data were available for 14- or 30-inch piles.

[1] = Navy 2017c.

[2] = NAVFAC 2016.

[3] = Navy 2019.

[4] = 24-inch sheets were used as a proxy for the 22.5-inch piles.

The distances to the pinniped airborne noise thresholds produced by the loudest pile installation method (impact installation of steel pipe piles or Z-shaped sheet piles) are shown in Table 6-10 and Figure 6-5. Because these areas are smaller than the underwater behavioral threshold zones, a separate analysis of Level B (behavioral) take was not conducted for the airborne zones. Animals in the airborne zones would already have been exposed within a Level B (behavioral) underwater zone; therefore, no

additional takes due to exposure to airborne noise are requested and acoustic harassment by airborne sounds is not analyzed further.

Table 6-10 Calculated and Measured Distances to Pinniped Behavioral Airborne Noise Thresholds

Section	*Pile Size and Count*	*Method*	*Total Pile Driving Days*	*Harbor Seal Threshold 90 dB RMS*	*Pinnipeds except Harbor Seals Threshold 100 dB RMS*
S499/ Pier 2	42-inch steel pipe (35)	I	18	38 m	11.9 m
	31.5-inch Z-shaped sheet pile (70 pair)	V/I	23	8 m/11 m	2.7 m/3.4 m
	14-inch steel H-piles (79)	V	14	2 m	0.8 m
S366	30-inch steel pipe pile (15)	I	15	150 m	47.4 m
	22.5-inch Z-shaped sheet pile (14 pair)	V/I	5	6 m/12 m	1.9 m/3.8 m
	14-inch steel H-piles (14)	V	3	2 m	0.8 m
Pier 1	22.5-inch Z-shaped sheet pile (27 pair)	V/I	9	6 m/12 m	1.9 m/3.8 m
	14-inch steel H-piles (26)	V	5	2 m	0.8 m
S45	30-inch steel pipe pile (4)	I	4	150 m	47.4 m
	22.5-inch Z-shaped sheet pile (80 pair)	V/I	27	6 m/12 m	1.9 m/3.8 m
	14-inch steel H-piles (76)	V	13	2 m	0.8 m
LNG	22.5-inch Z-shaped sheet pile (173 pair)	V/I	58	6 m/12 m	1.9 m/3.8 m
	14-inch steel H-piles (164)	V	28	2 m	0.8 m

Legend: I=impact; V=vibratory.

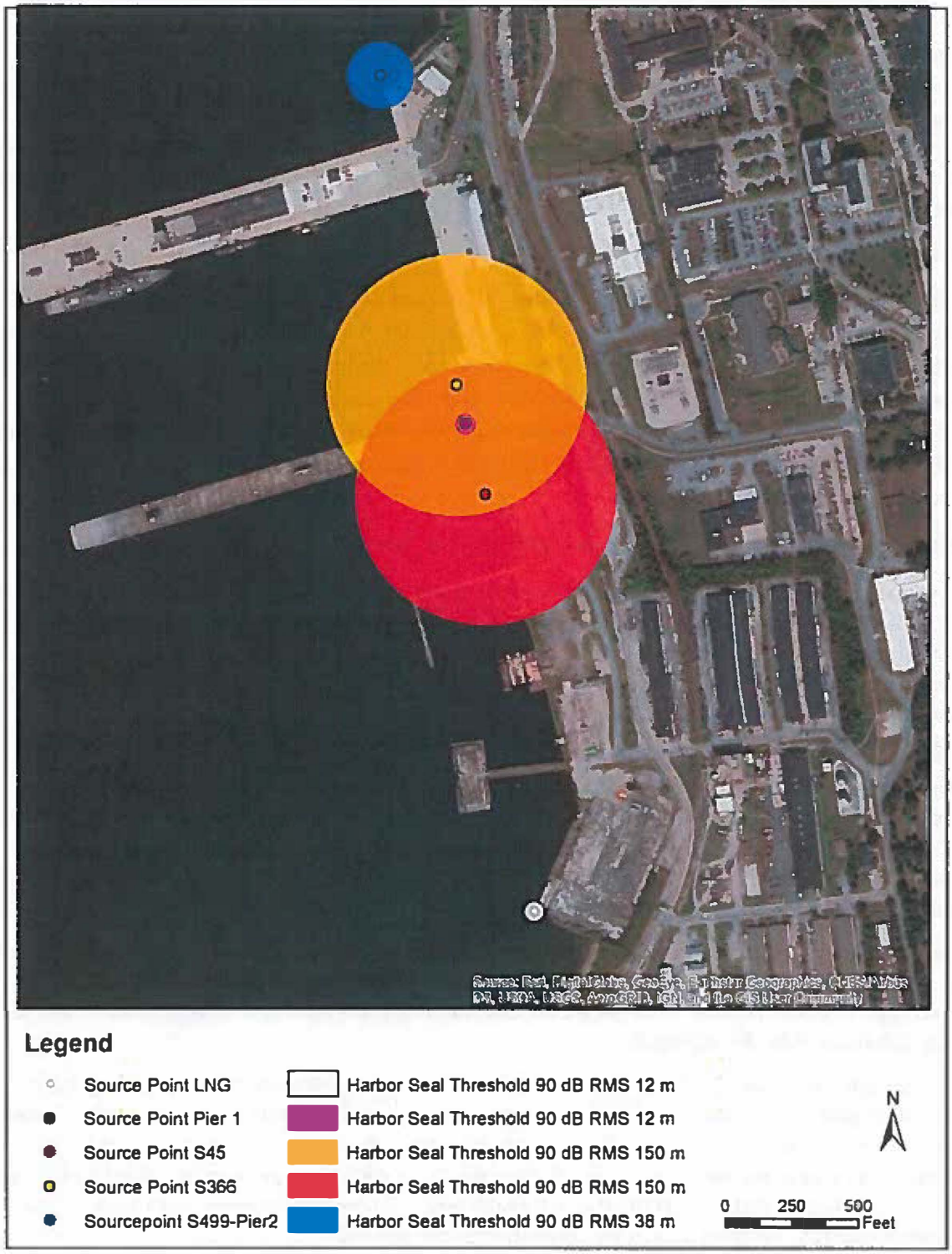


Figure 6-5 Representative Maximum ZOIs for Airborne Noise from Impact Pile Driving Activity

6.10 Estimated Duration of Pile Driving

Pile driving for the proposed project during years 1 through 4 will take approximately 222 non-consecutive days over a period of up to 60 non-consecutive months. Vibratory and impact steel sheet pile driving is assumed to occur during all 222 days. At this time, pile driving activities are anticipated to be completed within 4 years. However, because the proposed repairs are dependent on the allocation of funding, the Navy is requesting that the LOA be issued for the entire 5-year construction period to ensure flexibility in the project schedule.

6.11 Basis for Estimating Take by Harassment

The Navy is seeking authorization for the potential taking of Atlantic white-sided and short-beaked common dolphins, harbor porpoises, harbor seals, gray seals, harp seals, and hooded seals near NAVSTA Newport as a result of pile driving activities associated with the proposed project. The takes requested are expected to have no more than a minor effect on individual animals and no effect on the populations of these species. Any effects experienced by individual marine mammals are expected to be limited to short-term disturbance of normal behavior or temporary displacement of animals near the source of the noise.

6.12 Estimating Potential Exposures to Pile Driving Noise

Cetaceans spend their entire lives in the water and spend most of their time (greater than 90 percent for most species) entirely submerged below the surface. When at the surface, cetacean bodies are almost entirely below the water's surface, with only the blowhole exposed to allow breathing. This makes cetaceans difficult to locate visually and also exposes them to underwater noise, both natural and anthropogenic, essentially 100 percent of the time because their ears are nearly always below the water's surface.

Pinnipeds (seals and sea lions) spend significant amounts of time out of the water during breeding, molting, and hauling out periods. In the water, pinnipeds spend varying amounts of time underwater. When not actively diving, pinnipeds at the surface often orient their bodies vertically in the water column and hold their heads above the water surface. Consequently, pinnipeds may not be exposed to underwater sounds to the same extent as cetaceans.

For the purpose of assessing impacts from underwater sound, the Navy assumed that all cetacean and pinniped species spend 100 percent of their time underwater. This approach is conservative because seals spend a portion of their time hauled out and, therefore, are expected to be exposed to less sound than is estimated by this approach.

To quantitatively assess exposure of marine mammals to noise levels from pile driving using the NMFS threshold guidance, marine mammal density estimates used in the analysis came from NMSDD (Navy, 2017a) (see Chapter 3). To guard against unauthorized take, the Navy is requesting 1 Level B (behavioral) take of hooded seal per month of construction when this species may occur (Jan through May) for each construction year (total of 20 Level B takes). Consistent with past applications in the northeastern U.S., no Level A takes are requested for this species.

To determine the number of animals potentially exposed in the ZOI, the following equation was used:

Exposure estimate[5]= (N × ZOI) × maximum days of pile driving

Where:

N = density estimate used for each species

ZOI = Zone of Influence; the area where noise exceeds the noise threshold value

The following assumptions were used to calculate potential exposures to impact and vibratory pile driving noise for each threshold:

- Each animal can be taken via Level B (behavioral) harassment once every 24 hours.
- The pile type, size, and installation method that produce the largest ZOI were used to estimate exposure of marine mammals to noise impacts.
- All piles will have an underwater noise disturbance distance equal to the pile that causes the greatest noise disturbance (i.e., the pile farthest from shore) installed with the method that has the largest ZOI. If vibratory pile driving would occur, the largest behavioral ZOI will be produced by vibratory driving. In this case, the ZOI for an impact hammer will be encompassed by the larger behavioral ZOI from the vibratory driver.
- Days of pile driving were conservatively based on average daily production rates, but actual daily production rates may vary. Production rates would be maximized to the extent possible.

6.13 Exposure Estimates

Exposure estimates for all species are shown in Table 6-18 and are summarized by species in the following sections and presented in Tables 6-11 through 6-17. The Navy is requesting authorization for takes to ensure an adequate number are authorized for the proposed construction activities.

Exposure estimates generally do not differentiate between age, sex, or reproductive condition. However, some inferences can be made based on what is known about the life stages of the animals that visit or inhabit Narragansett Bay and Coddington Cove. When possible and with the available data, this is discussed by species in the sections that follow.

6.13.1 Atlantic White-Sided Dolphin

Atlantic white-sided dolphins occur seasonally, occurring primarily along the continental shelf and occasional unconfirmed opportunistic sightings in Narragansett Bay in fall and winter. The most recent observation of a pod of dolphins in Narragansett Bay was in Oct 2007 (NUWC Division, 2011). Construction activity could occur at any time of year and would be short-term and intermittent. Therefore, the average species density was determined to be appropriate for estimating takes of Atlantic white-sided dolphin. Based on density data for Narragansett Bay obtained from the NMSDD (Navy, 2017a), the average density of Atlantic white-sided dolphin for the largest ZOI was determined to be 0.003/km^2 (Table 3-1). This density was used to estimate abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI.

No Level A (PTS onset) takes of Atlantic white-sided dolphin are anticipated. Potential Level B

[5] Exposure estimate is rounded to a whole number at the end of the calculation

(behavioral) takes could occur if Atlantic white-sided dolphins are moving through the area during pile driving activities of which 1 Level B (behavioral) take is anticipated in Years 1, 3, and 4 and no takes estimated in Year 2 (Table 6-11). Because this species' regular occurrence is in much deeper waters than the extent of the ZOI (Hayes et al., 2019), takes of this species are extremely low. Should an Atlantic white-sided dolphin be exposed to sound from pile driving, take would be by behavioral harassment (Level B [behavioral]) only which may result in behavioral changes such as increased swimming speeds or increased surfacing time. Most likely, Atlantic white-sided dolphins would move away from the sound source with very little disruption to normal behavior. With the absence of any regular occurrence in Narragansett Bay, potential takes by disturbance would have a negligible short-term effect on individual Atlantic white-sided dolphins and would not result in population-level impacts.

Table 6-11 Level A (PTS Onset) and Level B (Behavioral) Takes of Atlantic White-Sided Dolphin by Construction Year

Construction Year	*Level A (PTS Onset)*	*Level B (Behavioral)*
Year 1 (S45)	0	1
Year 2 (S366 and Pier 01)	0	0
Year 3 (LNG)	0	1
Year 4 (S499/Pier 2)	0	1
TOTAL	0	3

6.13.2 Short-beaked Common Dolphin

Short-beaked common dolphins are the most likely dolphin species to be spotted in Narragansett Bay and usually in late fall or winter (Kenney, 2013). The most recent sighting of a short-beaked common dolphin recorded in Narragansett Bay was in October of 2016 (Hayes et al., 2019). Construction activity could occur at any time of year and would be short-term and intermittent. Therefore, the average species density was determined to be appropriate for estimating takes of short-beaked common dolphin. Based on density data for Narragansett Bay obtained from the NMSDD (Navy, 2017a), the average density of short-beaked common dolphin for the largest ZOI was determined to be 0.011/km^2 (Table 3-1). This density was used to estimate abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI.

No Level A (PTS onset) takes of short-beaked common dolphin are anticipated. Potential takes could occur if short-beaked common dolphins move through the area during construction activities of which up to 3 Level B (behavioral) takes are estimated in Years 1 and 4, 2 takes in Year 2 and up to 6 takes during Year 3 construction activities (Table 6-12). Because this species' regular occurrence is in much deeper waters than the extent of the ZOI (Hayes et al., 2019), takes of this species are extremely low. Should a short-beaked common dolphin be exposed to sound from pile driving, take would be by behavioral harassment (Level B [behavioral]) only, which may result in behavioral changes such as increased swimming speeds or increased surfacing time. Most likely, short-beaked common dolphins would move away from the sound source with very little disruption to normal behavior. Therefore, potential takes by disturbance would have a negligible short-term effect on individual short-beaked common dolphins and would not result in population-level impacts.

Table 6-12 Level A (PTS Onset) and Level B (Behavioral) Takes of Short-Beaked Common Dolphin by Construction Year

Construction Year	*Level A (PTS Onset)*	*Level B (Behavioral)*
Year 1 (S45)	0	3
Year 2 (S366 and Pier 01)	0	2
Year 3 (LNG)	0	6
Year 4 (S499/Pier 2)	0	3
Total	0	14

6.13.3 Harbor Porpoise

Harbor porpoise is the most stranded cetacean in Rhode Island with a strong seasonal occurrence in the spring. Construction activity could occur at any time of year and would be short-term and intermittent. Therefore, the average species density was determined to be appropriate for estimating takes of harbor porpoise. Based on density data for Narragansett Bay obtained from the NMSDD (Navy, 2017a), the average density of harbor porpoise for the largest ZOI was determined to be 0.012/km^2 (Table 3-1). This density was used to estimate abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI.

Potential takes could occur if harbor porpoises move through the area during construction activities. Small numbers of Level A (PTS onset) takes could occur during years 1, 3 and 4 and small numbers of Level B (behavioral) takes could occur each construction year (Table 6-13) with a maximum of up to 2 Level A (PTS onset) takes and 7 Level B (behavioral) takes during construction Year 3. Harbor porpoises are highly transitory and would likely move away from the sound source with very little disruption to normal behavior.

Table 6-13 Level A (PTS Onset) and Level B (Behavioral) Takes of Harbor Porpoise by Construction Year

Construction Year	*Level A (PTS Onset)*	*Level B (Behavioral)*
Year 1 (S45)	1	4
Year 2 (S366 and Pier 01)	0	2
Year 3 (LNG)	2	7
Year 4 (S499/Pier 2)	1	4
TOTAL	4	17

Harbor porpoise are not common to Narragansett Bay but may occur, especially in winter and spring months (Kinney 2013). With the absence of any regular occurrence adjacent to the project site, potential takes by harassment would have a negligible short-term effect on individual harbor porpoises and would not result in population-level impacts.

6.13.4 Harbor Seal

Harbor seals are the most common seal in Narragansett Bay; a well-known winter feeding ground for the species (Moll et al., 2017). Seals are commonly observed from late September through April (Moll et. al., 2017; DeAngelis, 2020). Of the 22 known haul outs within Narragansett Bay, "The Sisters" is the nearest haul out to the project area (0.9 miles). Harbor seals are rarely observed at The Sisters haul out in the early fall (September – October) but consistent numbers are regularly observed in mid-November

(0-10 animals). These numbers gradually increase with peak numbers in the upper 40s occurring in March, typically at low tide (DeAngelis, 2020). As discussed in Chapter 3, the NMSDD (Navy, 2017a) models harbor and gray seals as a guild due to the difficulty in distinguishing these species at sea. Therefore, the maximum species density was determined to be appropriate for estimating takes of harbor seal. Based on density data for Narragansett Bay (Navy, 2017a), the maximum density of harbor seals for the largest ZOI was determined to be 0.623/km^2 (Table 3-1). This density was used to estimate abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI.

Potential takes could likely involve harbor seals that are moving through the area on foraging trips or to area haul out sites as a result of pile driving noise. It is estimated that there could be a high of 25 Level A (PTS onset) and 353 Level B (behavioral) takes during Year 3 and the least takes estimated during Year 2 at 13 Level A (PTS onset) and 138 Level B (behavioral) takes (Table 6-14). Level A (PTS onset) takes would primarily occur during impact pile driving of sheet piles. Monitoring would aid in minimizing Level A (PTS onset) takes. Level B (behavioral) takes would primarily occur during vibratory pile driving activities. It should be noted that Level A (PTS onset) takes of harbor seals would likely be multiple exposures of the same individuals, rather than single exposures of unique individuals. This request overestimates the likely Level A (PTS onset) exposure because: (1) seals are unlikely to remain in the Level A (PTS onset) zone (i.e. shutdown zone) underwater long enough to accumulate sufficient exposure to noise resulting in PTS, and (2) the estimate assumes that new seals are in the Level A (PTS onset) ZOI every day during pile driving. Harbor seals that are taken could encounter permanent hearing loss and/or exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, harbor seals may move away from the sound source and be temporarily displaced from waters near the construction areas. As discussed above, Level A (PTS onset) takes would be minimized due to implementation of monitoring and shutdown procedures. With the absence of any major rookeries and only one haul out site ("The Sisters") within the noise ZOIs, potential takes by harassment would have a negligible short-term effect on individual harbor seals and would not result in population-level impacts.

Table 6-14 Level A (PTS Onset) and Level B (Behavioral) Takes of Harbor Seal by Construction Year

Construction Year	*Level A (PTS onset)*	*Level B (Behavioral)*
Year 1 (S45)	15	188
Year 2 (S366 and Pier 01)	13	138
Year 3 (LNG)	25	353
Year 4 (S499/Pier 2)	19	197
Total	72	876

6.13.5 Gray Seal

Based on stranding records, gray seals are seasonally present in Rhode Island with the largest populations occurring from February through June with a sharp peak in March and April. Gray seals are considered only occasional visitors to Narragansett Bay (Kenney, 2020). The NMSDD (Navy, 2017a) provides combined densities for harbor seal and gray seal (as discussed in Section 6.13.4 above). Therefore, the average species density was determined to be appropriate for determining takes of gray seal. Based on density data for Narragansett Bay (Navy, 2017a), the average density of gray seal for the largest ZOI was determined to be 0.131/km^2 (Table 3-1). This density was used to determine abundance

of animals that could be present in the area for exposure, using the equation abundance = n * ZOI.

Level A (PTS onset) and Level B (behavioral) takes may occur each construction year with up to 5 Level A (PTS onset) and 74 Level B (behavioral) takes anticipated during Year 3. A low of 3 Level A (PTS onset) and 28 Level B (behavioral) takes are anticipated during Year 2 (Table 6-15). A Level B (behavioral) take could occur if a gray seal is moving through the area on foraging trips or to an area haul out site during pile driving activities. Gray seals that are taken could encounter permanent hearing loss and/or exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, gray seals may move away from the sound source and be temporarily displaced from waters near the construction areas. With the absence of any major rookeries and only one haul out site ("The Sisters") within the noise ZOIs, as well as the overall more season-driving occurrence (spring to early summer) of this species in Narragansett Bay, potential takes by harassment would have negligible short-term effects on individual gray seals and would not result in population-level impacts.

Table 6-15 Level A (PTS Onset) and Level B (Behavioral) Takes of Gray Seal by Construction Year

Construction Year	*Level A (PTS Onset)*	*Level B (Behavioral)*
Year 1 (S45)	3	40
Year 2 (S366 and Pier 01)	3	28
Year 3 (LNG)	5	74
Year 4 (S499/Pier 2)	4	41
TOTAL	15	183

6.13.6 Harp Seal

Harp seals may be present in the project vicinity January through May. In general, harp seals are much rarer than the harbor seal and gray seal in Narragansett Bay and are rarely observed in the Bay (Kenney, 2015). Therefore, the minimum species density was determined to be appropriate for determining takes of harp seal. Based on density data for Narragansett Bay obtained from the NMSDD, the minimum density of harp seal for the largest ZOI was determined to be 0.050/km^2 (Table 3-1). This density was used to determine abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI.

It was estimated that 2 Level A (PTS onset) takes could occur during Year 3 and 1 Level A (PTS onset) take in Years 1, 2, and 4. Level B (behavior) takes are estimated at a low of 11 during Year 2 and a high of 29 during Year 3 (Table 6-16). Potential takes would result from harp seals moving through the area on foraging trips or to area haul out sites during pile driving activities. Harp seals that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, harp seals may move away from the sound source and be temporarily displaced from waters near the construction areas. With the absence of any major rookeries and only one haul out site ("The Sisters") within the noise ZOIs, as well as the overall rare occurrence of this species in Narragansett Bay, potential takes by harassment would have negligible short-term effects on individual harp seals and would not result in population-level impacts.

Table 6-16 Level A (PTS Onset) and Level B (Behavioral) Takes of Harp Seal by Construction Year

Construction Year	*Level A (PTS Onset)*	*Level B (Behavior)*
Year 1 (S45)	1	16
Year 2 (S366 and Pier 1)	1	11
Year 3 (LNG)	2	29
Year 4 (S499/Pier 2)	1	16
TOTAL	5	72

6.13.7 Hooded Seal

Hooded seals may be present in the project vicinity from January through May, although their exact seasonal densities are unknown. In general, hooded seals are much rarer than the harbor seal and gray seal in Narragansett Bay and are rarely observed in the Bay (Kenney, 2005). Based on density data for Narragansett Bay obtained from the NMSDD, the minimum density of hooded seal for the largest ZOI was determined to be 0.001/km^2 (Table 3-1). This density was used to estimate abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI.

Hooded seals have the potential to occur but are considered the least likely seal to be present in Narragansett Bay. No Level A (PTS onset) or Level B (behavioral) takes are anticipated during any construction year (Table 6-17). However, in order to guard against unauthorized take, the Navy is requesting 1 Level B (behavioral) take of hooded seal per month of construction when this species may occur (Jan through May) for each construction year (total of 20 Level B takes). No Level A takes are requested for this species. Most likely, hooded seals may move away from the sound source and be temporarily displaced from waters near the construction areas. With the absence of any major rookeries and only one haul out (The Sisters) within the noise ZOIs, as well as the overall rare occurrence of this species in Narragansett Bay, potential takes by harassment would have a negligible short-term effect on individual hooded seals and would not result in population-level impacts.

Table 6-17 Level A (PTS Onset) and Level B (Behavioral) Takes of Hooded Seal by Construction Year

Construction Year	*Level A (PTS Onset)*	*Level B (Behavioral)*
Year 1 (S45)	0	5
Year 2 (S366 and Pier 1)	0	5
Year 3 (LNG)	0	5
Year 4 (S499/Pier 2)	0	5
TOTAL	0	20

Table 6-18 Total Underwater Exposure Estimates by Species for All Construction Years

Marine Mammals	Underwater Vibratory Pile Driving Criteria (e.g., non-impulsive/continuous sounds)				Underwater Impact Pile Driving Criteria (e.g., impulsive sounds)				Total Takes (Level A [PTS onset] + Level B [behavioral])
	Level A[1] (PTS onset) Threshold 173 dB SEL[2] Porpoise	Level A[1] (PTS onset) Threshold 198 dB SEL[2] Dolphins	Level A[1] (PTS onset) Threshold 201 dB SEL[2] Seals	Level B (Behavioral) Harassment Threshold 120 dB rms[3]	Level A[1] (PTS onset) Threshold 155 dB SEL[2] Porpoise	Level A[1] (PTS onset) Threshold 185 dB SEL[2] Dolphins	Level A[1] (PTS onset) 185 dB SEL[2] Seals	Level B (Behavioral) Harassment Threshold 160 dB rms[3]	
Year 1									
Atlantic white-sided dolphin	NA	0	NA	1	NA	0	NA	0	1
Short-beaked common dolphin	NA	0	NA	3	NA	0	NA	0	3
Harbor porpoise	0	NA	NA	4	1	NA	NA	0	5
Harbor seal	NA	NA	0	180	NA	NA	15	8	203
Gray seal	NA	NA	0	38	NA	NA	3	2	43
Harp seal	NA	NA	0	15	NA	NA	1	1	17
Hooded seal	NA	NA	0	5[4]	NA	NA	0	0	5[4]
SUBTOTAL	*0*	*0*	*0*	*246*	*1*	*0*	*19*	*11*	*277*
Year 2									
Atlantic white-sided dolphin	NA	0	NA	0	NA	0	NA	0	0
Short-beaked common dolphin	NA	0	NA	1	NA	0	NA	1	2
Harbor porpoise	0	NA	NA	1	0	NA	NA	1	2
Harbor seal	NA	NA	0	102	NA	NA	13	36	151
Gray seal	NA	NA	0	21	NA	NA	3	7	31
Harp seal	NA	NA	0	8	NA	NA	1	3	12
Hooded seal	NA	NA	0	5[4]	NA	NA	0	0	5[4]
SUBTOTAL	*0*	*0*	*0*	*138*	*0*	*0*	*17*	*48*	*203*
Year 3									
Atlantic white-sided dolphin	NA	0	NA	1	NA	0	NA	0	1

Table 6-18 Total Underwater Exposure Estimates by Species for All Construction Years

Marine Mammals	Underwater Vibratory Pile Driving Criteria (e.g., non-impulsive/continuous sounds)				Underwater Impact Pile Driving Criteria (e.g., impulsive sounds)				Total Takes (Level A [PTS onset] + Level B [behavioral])
	Level A[1] (PTS onset) Threshold 173 dB SEL[2] Porpoise	Level A[1] (PTS onset) Threshold 198 dB SEL[2] Dolphins	Level A[1] (PTS onset) Threshold 201 dB SEL[2] Seals	Level B (Behavioral) Harassment Threshold 120 dB rms[3]	Level A[1] (PTS onset) Threshold 155 dB SEL[2] Porpoise	Level A[1] (PTS onset) Threshold 185 dB SEL[2] Dolphins	Level A[1] (PTS onset) 185 dB SEL[2] Seals	Level B (Behavioral) Harassment Threshold 160 dB rms[3]	
Short-beaked common dolphin	NA	0	NA	6	NA	0	NA	0	6
Harbor porpoise	0	NA	NA	7	2	NA	NA	0	9
Harbor seal	NA	NA	0	353	NA	NA	25	0	378
Gray seal	NA	NA	0	74	NA	NA	5	0	79
Harp seal	NA	NA	0	29	NA	NA	2	0	31
Hooded seal	NA	NA	0	5[4]	NA	NA	0	0	5[4]
SUBTOTAL	*0*	*0*	*0*	*475*	*2*	*0*	*32*	*0*	*509*
Year 4									
Atlantic white-sided dolphin	NA	0	NA	1	NA	0	NA	0	1
Short-beaked common dolphin	NA	0	NA	3	NA	0	NA	0	3
Harbor porpoise	0	NA	NA	4	1	NA	NA	0	5
Harbor seal	NA	NA	0	186	NA	NA	19	11	216
Gray seal	NA	NA	0	39	NA	NA	4	2	45
Harp seal	NA	NA	0	15	NA	NA	1	1	17
Hooded seal	NA	NA	0	5[4]	NA	NA	0	0	5[4]
SUBTOTAL	*0*	*0*	*0*	*253*	*1*	*0*	*24*	*14*	*292*
Total all species	**0**	**0**	**0**	**1,112**	**4**	**0**	**92**	**73**	**1,281**

Notes: There will be no non-auditory takes (see Section 5.2).

[1] Level A (PTS onset) takes would likely be multiple exposures of the same individual, rather than single exposures of unique individuals.

[2] dB re 1 µPa²-s.

[3] dB re 1µPa rms

[4] - To guard against unauthorized take, the Navy is requesting 1 Level B (behavioral) take of hooded seal per month of construction when this species may occur (Jan through May) for each construction year.

7 IMPACTS ON MARINE MAMMAL SPECIES OR STOCKS

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

7.1 Potential Effects of Pile Driving on Marine Mammals

The effects of pile driving on marine mammals is dependent on several factors, including the species, size, and depth of the animal; the depth, intensity, and duration of the underwater construction sound; the depth of the water column; the substrate of the habitat; the distance between the sound source and the animal; and the sound propagation properties of the environment. Impacts on 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 should 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 (e.g., sand) will absorb or attenuate the sound more readily than hard substrates (e.g., 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 will ultimately decrease the intensity of the acoustic source (Dahl et al., 2015).

Potential impacts on marine species are expected to be the result of physiological responses to both the type and strength of the acoustic signature (Viada et al., 2008). Behavioral impacts may also occur, though the type and severity of these effects are more difficult to define due to limited studies addressing the behavioral effects of impulsive as well as non-impulsive sounds on marine mammals. Potential effects can range from brief acoustic effects such as behavioral disturbance, tactile perception, physical discomfort, slight injury of the internal organs and temporary to permanent impairment of the auditory system to death of the animal (Yelverton et al., 1973; O'Keefe and Young, 1984; Ketten, 1995; Dahl et al., 2015; Finneran 2015; Kastelein et al., 2016, 2018).

7.1.1 Physiological Responses

Direct tissue responses to impact/impulsive sound stimulation may range from mechanical vibration or compression with no resulting injury to tissue trauma (injury). Because the ears are the most sensitive organ to pressure, they are the organs most sensitive to injury (Ketten, 2000). Sound-related trauma can be lethal or sub-lethal. Lethal impacts are those that result in immediate death or serious debilitation in or near an intense source (Ketten, 1995). Sub-lethal damage to the ear from a pressure wave can rupture the tympanum, fracture the ossicles, damage the cochlea, cause hemorrhage, and leak cerebrospinal fluid into the middle ear (Ketten 2004). 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 PTS) can occur when the hair cells of the ear are damaged by a very loud event, as well as prolonged exposure to noise.

Instances of TTS and/or auditory fatigue are well documented in marine mammal literature as being one of the primary avenues of acoustic impact. TTS has been documented in controlled settings using captive marine mammals exposed to strong SELs at various frequencies (Ridgway et al., 1997; Kastak et al., 1999; Finneran et al., 2005; Finneran 2015). While injuries to other sensitive organs are possible,

they are less likely since pile driving impacts are almost entirely acoustically mediated. Based on the mitigation measures outlined in Chapter 11 and the conservative modeling assumptions discussed in Chapter 6, harbor seals are likely to be present as they are common in the area. Harbor porpoise may also be present as they have been observed transiting the area. Gray, hooded, and harp seals have not been observed in the proposed project area and, therefore, are less likely to be present. Auditory effects could be experienced by individual seals in the project area but are not expected to cause population-level impacts or affect the continued survival of the species.

7.1.2 Behavioral Responses

Behavioral responses to sound are highly variable and context specific. For each potential behavioral change, the magnitude of the 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. Habituation occurs when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al., 2004). 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., 2004). 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 swimming speed, increased surfacing time, and cessation of foraging in the affected area would indicate disturbance or discomfort. Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance.

Controlled experiments with captive marine mammals showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway et al., 1997; Finneran et al., 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic guns or acoustic harassment devices, and also including pile driving) 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., 2004; and Nowacek et al., 2007). Some studies of acoustic harassment and acoustic deterrence devices have found habituation in resident populations of seals and harbor porpoises (see review in Southall et al., 2007). Blackwell et al. (2004) found that ringed seals exposed to underwater pile driving sounds in the 153 to 160 dB RMS range tolerated this noise level and did not seem unwilling to dive. One individual was as close as 207 ft (63 m) from the pile driving. Responses of two pinniped species to impact pile driving at the San Francisco-Oakland Bay Bridge East Span Seismic Safety Project were mixed (California Department of Transportation [CALTRANS], 2001; 2006; 2010). Harbor seals were observed in the water at distances of approximately 1,300 to 1,650 ft (400 to 500 m) from the pile driving activity. The observed harbor seals exhibited no alarm responses, although several showed alert reactions, and none of the seals appeared to remain in the area. One of these harbor seals was even seen to swim to within 492 ft (150 m) of the pile driving barge during pile driving.

Studies of marine mammal responses to continuous noise, such as vibratory pile installation, are limited.

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). Most marine mammals observed during the two lengthy construction periods (i.e., beluga whales, harbor seals, harbor porpoises, and Steller sea lions) were observed in smaller numbers. Background noise levels at this port are typically at 125 dB.

A comprehensive review of acoustic and behavioral responses to noise exposure by Nowacek et al. (2007) concluded that one of the most common behavioral responses is displacement. To assess the significance of displacement, 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 that they return to the pre-disturbance area. Short-term displacement may not be of great concern unless the disturbance happens repeatedly. Similarly, long-term displacement may not be of concern if adequate replacement habitat is available.

Marine mammals encountering noise producing operations over the project's proposed construction timeframe will likely avoid affected areas where they experience noise-related discomfort, limiting their ability to forage or rest there. As described in the section above, individual responses to noise are expected to be variable: some individuals may occupy the project area during noise generating activities without apparent discomfort, but others may be displaced with undetermined long-term effects. For example, harbor seals have been observed to temporarily avoid areas within 15 mi of active pile driving starting from predicted received levels of between 166 and 178 dB re 1 µPa (Russell et al., 2016). Avoidance of the affected area during pile driving operations will reduce the likelihood of injury impacts and seals have not been observed foraging in and around the project area. Noise-related disturbance may also inhibit some marine mammals from transiting the area. Given the duration of the in-water construction period, there is a potential for displacement of marine mammals from the affected area due to these behavioral disturbances during the in-water construction period. However, habituation over time may occur, along with a decrease in the severity of responses. In addition, since impulse noise generating activities (pile driving) will only occur during daylight hours, marine mammals transiting the proposed project area or foraging or resting in the proposed project area at night will not be affected. Effects of noise generating activities will be experienced by individual marine mammals but are not expected to cause population-level impacts or affect the continued survival of the species.

7.2 Conclusions Regarding Impacts on Species or Stocks

Individual marine mammals may be exposed to increased SPLs during pile driving operations, which may result in Level B (behavioral) harassment to all marine mammals and Level A (PTS onset) harassment for harbor porpoise, harbor seals and harp seals. Any marine mammals that are exposed (harassed) may change their normal behavior patterns (e.g., swimming speed, foraging habits, etc.) or be temporarily displaced from the area of construction. Any exposures to Level B (behavioral) harassment will likely have only a minor effect on individuals and no effect on the population. For seal species, exposure to Level A (PTS onset) harassment during impact pile driving could result in a permanent change in hearing thresholds. Similar impacts could be experienced by harbor porpoise, but this species would not be expected to linger in the area and is more likely to transit through with very little change to their hearing thresholds. To avoid permanent impacts to sea and harbor porpoise hearing, a shutdown zone will be implemented that encompasses as much of the Level A (PTS onset) zone as practicable (See Table 5-2) (i.e. up to 150 meters from the point of noise generation). The sound generated from vibratory pile driving will not result in injury to marine mammals because the areas where injury could potentially

occur (i.e. shutdown zone) are small and will be fully monitored. Pile driving will stop if marine mammals approach the shutdown zones. Mitigation is expected to avoid most potential adverse underwater impacts to marine mammals from impact pile driving. Nevertheless, some exposure is 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 population recruitment, survival, or recovery.

8 IMPACTS ON SUBSISTENCE USE

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

This Chapter is not applicable. The project ROI is within Narragansett Bay and Coddington Cove in Rhode Island. No traditional subsistence hunting areas are within the region.

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9 IMPACTS ON 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.

Impacts to habitat will be temporary and include increased human activity and noise levels and localized, minor impacts to water quality near the individual project sites. Impacts will not result in permanent impacts to habitats used directly by marine mammals.

9.1 Effects from Human Activity and Noise

Existing human activity and underwater noise levels, primarily due to industrial activity and vessel traffic, could increase above baseline temporarily during in-water construction.

Marine mammals in proposed project and surrounding areas encounter vessel traffic associated with both Navy and non-Navy activities. Behavioral changes in response to vessel presence include avoidance reactions, alarm/startle responses, temporary abandonment of haul outs by pinnipeds, and other behavioral and stress-related changes (such as altered swimming speed, direction of travel, resting behavior, vocalizations, diving activity, and respiration rate) (Watkins, 1986; Würsig et al., 1998; Terhune and Verboom, 1999; Ng and Leung, 2003; Foote et al., 2004; Mocklin, 2005; Bejder et al., 2006; Nowacek et al., 2007). Some dolphin species approach vessels and are observed bow riding or jumping in the wake of vessels (Norris and Prescott, 1961; Shane et al., 1986; Würsig et al., 1998; Ritter, 2002). In other cases, neutral behavior (i.e., no obvious avoidance or attraction) has been reported (review in Nowacek et al., 2007). Little is known about the biological importance of changes in marine mammal behavior under prolonged or repeated exposure to high levels of vessel traffic, such as increased energetic expenditure or chronic stress, which can produce adverse hormonal or nervous system effects (Reeder and Kramer, 2005).

During pile driving activities, additional vessels may operate in the proposed project area, but will operate at low speeds within the relatively limited construction zone and access route during the in-water construction period. The presence of vessels will be temporary and occur at current Navy and United States Coast Guard facilities that have some level of existing vessel traffic. Therefore, effects are expected to be limited to short-term behavioral changes and are not expected to rise to the level of take or harassment as defined under the MMPA.

Additional noise could be generated by barge-mounted equipment, such as cranes and generators, but this noise will typically not exceed existing underwater noise levels resulting from existing routine waterfront operations. While the increase may change the quality of the habitat, it is not expected to exceed the Level A (PTS onset) harassment or Level B (behavioral) harassment thresholds and impacts to marine mammals from these noise sources is expected to be negligible.

9.2 Pile Driving Effects on Potential Foraging Habitat

Temporary and localized reduction in-water quality will occur as a result of in-water construction activities. Most of this effect will occur during the installation of piles, dredging, and revetment replacement when bottom and intertidal sediments are disturbed. Effects to turbidity and

sedimentation are expected to be short-term, minor, and localized. Since the currents are so strong in the area, suspended sediments in the water column should dissipate and quickly return to background levels. Following the completion of sediment-disturbing activities, the turbidity levels are expected to return to normal ambient levels following the end of construction in all construction scenarios. Turbidity within the water column has the potential to reduce the level of oxygen in the water and irritate the gills of prey fish species in the proposed project area. However, turbidity plumes associated with the project would be temporary and localized, and fish in the proposed project area would be able to move away from and avoid the areas where plumes may occur. Therefore, it is expected that the impacts on prey fish species from turbidity, and therefore on marine mammals, would be minimal and temporary. In general, the area likely impacted by the project is relatively small compared to the available habitat in Narragansett Bay. As a result, activity at the project site would be inconsequential in terms of its effects on marine mammal foraging.

9.3 Underwater Noise Impacts on Fish

The greatest potential impact to fish during construction would occur during impact pile driving when pile driving noise would exceed the established underwater noise injury and TTS thresholds for fish. However, the duration of impact pile driving (with the exception of 30-inch and 42-inch pipe pile install) would be limited to the final stage of installation after the pile has been driven as close as practicable to the design depth with a vibratory driver.

Fishes are vulnerable to tissue damage and hearing loss from impact pile driving activities, but studies evaluating how fish detect particle motion components of sound indicate that exposure levels associated with vibratory or continuous sound do not produce tissue damage (Hastings, 2014; Hawkins and Popper 2018a, b). Results of studies on various stress parameters and behavioral responses in fish are highly variable. All studies, including those for long- and short-term exposure, were conducted on captive fish in enclosed areas where fish could not avoid the sounds. It is possible that it was not necessarily the sound itself that resulted in the stress response, but rather the inability for the fish to move away from the disturbing sound.

Research has shown that stress from noise is greater as a result of intermittent sounds than for vibratory and continuous sounds (Popper et al., 2019). Vibratory pile driving would possibly elicit behavioral reactions from fish such as temporary avoidance of the area but is unlikely to cause injuries to fish or have persistent effects on local fish populations. In addition, the project area is located in a bay with various coves and inlets that is subject to marine traffic from recreational boaters and commercial shipping, and thus fish are consistently exposed to continuous noise sources from vessel noise and other anthropogenic noise from adjacent facilities. In general, impacts on marine mammal prey species are expected to be minor and temporary.

Therefore, adverse effects to the marine mammal prey base will be insignificant and will not rise to the level of MMPA take.

9.4 Summary of Impacts on Marine Mammal Habitat

All marine mammal species using habitat near the proposed project area are primarily transiting the area; the closest known foraging or haul out area is located just under 1 mile from the proposed project area. The most likely impacts on marine mammal habitat for the Project are from underwater noise, turbidity, and potential effects on the food supply. However, it is not expected that any of these impacts would be significant.

Construction may have impacts on benthic invertebrate species, another marine mammal prey source. Direct benthic habitat loss would result with the permanent loss of approximately 0.7 acres of benthic habitat from bulkhead replacement/repair. However, the areas to be permanently removed are within the Derecktor Shipyard offshore IR site and adjacent to the existing bulkhead along the NAVSTAs industrial waterfront. Habitat quality in this area is generally low and has been previously disturbed as part of offshore remediation activities. Therefore, impacts of the project are not likely to have adverse effects on marine mammal foraging habitat in the proposed project area.

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10 IMPACTS ON 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 proposed activities would result in the loss of approximately 0.7 acres of nearshore benthic habitat but, as discussed in section 9.4, these areas are previously disturbed and of low quality and would not significantly impact available prey for marine mammals. The most important impacts on marine fish species consumed by marine mammals will result from potential injury and behavioral disturbance to fish species during pile driving. Information provided in Chapter 9 indicates there may be temporary impacts, but those impacts will be short-term and construction noise will cease upon the completion of in-water construction activities.

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11 MEANS OF EFFECTING THE LEAST PRACTICABLE ADVERSE IMPACTS – STANDARD OPERATING PROCEDURES AND MITIGATION MEASURES

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

The Navy will employ the minimization measures listed in this chapter to avoid and minimize impacts on marine mammals, their habitats, and forage species. Best management practices (BMPs) and minimization measures are included in the construction contract plans and must be agreed upon by the contractor prior to any construction activities.

11.1 General Construction Best Management Practices

The construction contractor will be responsible for preparation of an environmental protection plan. The plan will 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.

- No petroleum products, chemicals, or other toxic or harmful materials shall be allowed to enter surface waters.
- Washwater resulting from washdown of equipment or work areas shall be contained for proper disposal and shall not be discharged unless authorized.
- Equipment that enters surface waters shall be maintained to prevent any visible sheen from petroleum products.
- 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 to occur. Fuel hoses, oil drums, oil or fuel transfer valves, fittings, etc. shall be checked regularly for leaks. Materials will be maintained and stored properly to prevent spills.
- No cleaning solvents or chemicals used for tools or equipment cleaning shall be discharged to ground or surface waters.
- Any floating debris generated during installation will be retrieved. Any debris in a containment boom will be removed by the end of the workday or when the boom is removed, whichever occurs first. Retrieved debris will be disposed of at an upland disposal site.

11.2 Minimization Measures for Marine Mammals

The following minimization measures will be implemented during pile driving to reduce exposure to Level A (PTS onset) harassment and Level B (behavioral) harassment and avoid non-auditory injury.

11.2.1 Coordination

The Navy shall conduct briefings between construction supervisors and crews, the marine mammal monitoring team, and Navy staff prior to the start of all pile driving activities and when new personnel join the work. These briefings would explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

11.2.2 Acoustic Minimization Measures

Vibratory pile installation will be used to the extent possible to minimize high SPLs associated with impact pile driving.

11.2.3 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 will be used for impact pile driving at the beginning of each day's in-watere pile driving or any time pile driving has ceased for more than 30 minutes.e
- The contractor will provide an initial set of strikes from the impact hammer at reduced energy,e followed by a 30-sec waiting period, then two subsequent sets. (The reduced energy of ane individual hammer cannot be quantified because it varies by individual drivers. Also, the numbere of strikes will vary at reduced energy because raising the hammer at less than full power ande then releasing it results in the hammer "bouncing" as it strikes the pile, resulting in multiplee "strikes.")e

11.2.4 Visual Monitoring and Shutdown Procedures

A Marine Mammal Monitoring Plan will be submitted to NMFS for approval prior to commencement of project activities. At a minimum, the plan will include the following:

In order to reduce the potential for Level A (PTS onset) or Level B (behavioral) harassment, the following visual monitoring will be implemented and shutdown procedures will be put into effect if a marine mammal were to approach the shutdown zone for the activity being conducted. Impacts are expected to be insignificant and no injury would be expected as monitors will ensure the shutdown zone is clear of mammals before the start of in-water noise generating activities.

- For all impact and vibratory pile driving, Level A (PTS onset) and Level B (behavioral) harassmente zones will be visually monitored (Table 11-1) with implementation of shutdown zones to avoide injury (see Table 5-2).e
- In order to prevent injury from physical interaction with construction equipment, a shutdowne zone of 33 ft or 10 meters will be implemented during all in-water construction activities havinge the potential to affect marine mammals to ensure marine mammals are not present within thise zone. These activities could include but are not limited to 1) barge positioning, 2) dredging, or 3)e pile driving. For some sound-generating activities, the potential for Level A (PTS onset)e harassment by acoustic injury extends less than 10 m from the source, and for these activities,e the shutdown zone automatically mitigates/minimizes Level A (PTS onset) harassment (Table 11-e 1).e

- If a marine mammal species for which incidental take has not been authorized is seen approaching or entering the shutdown zone or the disturbance zone during pile driving, the noise producing activity will cease. If such circumstances recur, the Navy will consult with NMFS concerning the potential need for an additional take authorization.
- Pile driving will cease if any marine mammal is detected in or approaching the shutdown zone (i.e. Level A [PTS onset] harassment zone] up to 150 meters). If a marine mammal is observed in the disturbance zone (I.e. Level B [behavioral] harassment zone and, if present, the Level A [PTS onset] harassment zone] beyond 150 meters), but not approaching or entering the shutdown zone, a take will be recorded, and the work will be allowed to proceed without cessation.
- All species that enter either the Level A (PTS onset) harassment or Level B (behavioral) harassment zones will be monitored and documented, with the PSO estimating the amount of time the animal spends within the Level A or Level B zone while pile driving is underway.
- In the event of a shutdown, pile driving will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have elapsed without re-detection of the animal.
- Visual monitoring will take place from 30 minutes prior to initiation through 30 minutes post-completion of pile driving. Prior to the start of pile driving, the shutdown zone and disturbance zone will be monitored for 30 minutes to ensure that the zones are clear of marine mammals. Pile driving will only commence once observers have declared the shutdown zone clear of marine mammals.
- Visual monitoring will be conducted by experienced biologists with training in marine mammal detection and the ability to describe relevant behaviors that may occur in proximity to in-water construction activities (hereafter "Protected Species Observers" [PSOs]).
- Visual monitoring will be conducted by, at a minimum, a two-person marine mammal monitoring team designated by the construction contractor. Given the configuration of the ROI for each bulkhead segment being replaced/repaired, it is assumed that two to three marine mammal observers would be sufficient to monitor the respective ROI given the abundance of suitable vantage points. However, additional monitors may be added if warranted by site conditions and/or the level of marine mammal activity in the area. Trained PSOs will be placed at the best vantage point(s) practicable (Figure 11-1) to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for a shutdown to the pile driver operator.
- The PSOs shall have no other construction-related tasks while conducting monitoring.
- If the shutdown zone is obscured by fog or poor lighting conditions, pile driving will not be initiated until the entire shutdown zone is visible.

Table 11-1 Proposed Shutdown and Disturbance Zones by Activity and Marine Mammal

Pile Type	*Installation Method*	*Pile Diameter*	*Shut Down Zone For Harbor Porpoise*	*Shut Down Zone for Seals*	*Disturbance Zone*
Steel pipe	Impact	30-inch	150* meters	150* meters	2,500 meters
	Impact	42-inch	150* meters	50 meters	1,000 meters
Steel H	Vibratory	14-inch	10 meters	10 meters	ROI
Z-Shaped Steel Sheet	Vibratory	22.5-inch	25 meters	10 meters	ROI
	Impact	22.5-inch	150* meters	150* meters	2,500 meters
	Vibratory	31.5-inch	20 meters	10 meters	ROI
	Impact	31.5-inch	150 meters*	150* meters	2,500 meters

Notes: * = Monitoring zone distance previously negotiated with NMFS for other Navy projects in New England.

11.2.5 Acoustic Measurements.

For further detail regarding our acoustic monitoring plan, see Section 13.2.

11.2.6 Mitigation Effectiveness

As identified in 11.2.4, all PSOs utilized for mitigation activities will be experienced biologists with training in marine mammal detection and behavior. Due to their specialized training, the Navy expects that visual mitigation will be highly effective. Trained PSOs have specific knowledge of marine mammal physiology, behavior, and life history that may improve their ability to detect individuals or help determine whether observed animals are exhibiting behavioral reactions to construction activities. Visual detection conditions in the proposed project area are generally excellent. Located in Narragansett Bay, the project area is sheltered from large swells. PSOs will be positioned in locations that provide the best vantage point(s) for monitoring for the section of bulkhead being replaced/repaired, such as on nearby breakwaters, Gould Island, Coddington Point, or Taylor Point (Figure 11-1). A minimum of 2 PSOs shall be posted during pile driving. Any activity that would result in threshold exceedance at or more than 1,000 meters would require a minimum of three PSOs to effectively monitor the entire ROI. As such, proposed mitigation measures are likely to be very effective.

Figure 11-1 Potential Protected Species Observer Vantage Points

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12 ARCTIC PLAN OF COOPERATION

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.

(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.

This section is not applicable. There is no subsistence use of marine mammal species or stocks in the proposed project area.

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13 MONITORING AND REPORTING EFFORTS

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.

The Navy intends to complete marine mammal and acoustic monitoring of the proposed project area in order to provide a more robust assessment of sound levels from pile driving and marine mammal responses, and to refine avoidance and minimization measures as warranted by the results. A marine mammal monitoring plan will be developed further and submitted to NMFS for approval in advance of the start of construction of the LOA period.

The following monitoring measures would be implemented along with the mitigation measures (Section 11) in order to reduce impacts to marine mammals to the lowest extent practicable during the period of this LOA.

13.1 Marine Mammal Monitoring Plan

A marine mammal monitoring plan will be prepared and submitted to NMFS for approval well in advance of the start of construction of the LOA period. Visual monitoring of the Level A (PTS onset) shutdown and Level B (behavioral) disturbance zone would occur for 100 percent of pile driving. If a marine mammal is observed entering the Level B (behavioral) disturbance zone, an exposure would be recorded, and behaviors documented. All observers (PSOs) will be trained in marine mammal identification and behaviors. NMFS requires that the PSOs have no other construction-related tasks while conducting monitoring.

13.1.1 Methods of Monitoring

The Navy will monitor the Level A (PTS onset) shutdown zone and Level B (behavioral) disturbance zone before, during, and after pile driving activities. Based on NMFS requirements, the Marine Mammal Monitoring Plan would include the following procedures:

- PSOs will be located on land, land based features such as docks, piers, or bridges, or small craft vessels in order to properly see the entire shutdown zone(s).
- The number of PSOs would vary from two to three depending on the size of the zone associated with the type of noise generating activity occurring; site conditions, and the level of marine mammal activity.
- PSOs will be located at the best vantage point(s) to observe the zone associated with behavioral impact thresholds.
- During all observation periods, observers will use binoculars and the naked eye to search continuously for marine mammals.
- Monitoring distances will be measured with range finders.

- Distances to animals will be based on the best estimate of the PSO, relative to known distances to objects in the vicinity of the PSO.
- Bearing to animals will be determined using a compass.
- A census of pinniped species hauled out in the vicinity of pile driving encompassing the Level B (behavioral) harassment ZOIs will be performed.
- In-water activities will be curtailed under conditions of fog or poor visibility that might obscure the presence of a marine mammal within the Level A (PTS onset) shutdown zone.
- Pre-Activity Monitoring:
    - The Level A (PTS onset) shutdown and Level B (behavioral) disturbance zones will be monitored for 30 minutes prior to in-water construction/demolition activities. If a marine mammal is present within the Level A (PTS onset) shutdown zone, the activity will be delayed until the animal(s) leave the Level A (PTS onset) shutdown zone. Activity will resume only after the PSO has determined that, through sighting or by waiting approximately 30 minutes, the animal has moved outside the Level A (PTS onset) shutdown zone. If a marine mammal is observed approaching the Level A (PTS onset) shutdown zone, the PSO who sighted that animal will notify the Level A (PTS onset) shutdown zone PSO(s) of its presence.
- During Activity Monitoring:
    - If a marine mammal is observed entering the Level B (behavioral) disturbance zone, that activity will be completed without cessation, unless the animal enters or approaches the Level A (PTS onset) shutdown zone, at which point all activities will be halted. If an animal is observed within the Level A (PTS onset) shutdown zone during pile driving, the activity will be stopped as soon as it is safe to do so. Pile driving can only resume once the animal has left the Level A (PTS onset) shutdown zone of its own volition or has not been re-sighted for a period of 15 minutes.
- Post-Activity Monitoring:
    - Monitoring of the Level A (PTS onset) shutdown and Level B (behavioral) disturbance zones will continue for 30 minutes following the completion of the activity.

13.1.2 Data Collection

NMFS requires that the PSOs use NMFS-approved sighting forms and that, at a minimum, the following information be collected on the sighting forms:

- date and time that pile driving begins or ends
- construction activities occurring during each observation period
- weather parameters identified in the acoustic monitoring (e.g., wind, humidity, temperature)
- tide state and water currents
- visibility
- species, numbers, and, if possible, sex and age class of marine mammals
- marine mammal behavior patterns observed, including bearing and direction of travel, and, if possible, the correlation to SPLs
- distance from pile driving activities to marine mammals and distance from the marine mammal to the observation point
- estimated amount of time an animal spends within the Level A or Level B harassment zones while pile driving is underway
- locations of all marine mammal observations

- other human activity in the area

To the extent practicable, the Navy will record behavioral observations that may make it possible to determine whether the same or different individuals are being taken as a result of project activities over the course of a day.

13.2 Hydroacoustic Monitoring Plan

The Navy will implement in situ acoustic monitoring efforts to measure SPLs from in-water construction activities. The Navy will collect and evaluate acoustic sound recording levels during pile driving activities. Hydrophones would be placed at locations 33 ft from the noise source and, where the potential for Level A (PTS onset) harassment exists, at a second representative monitoring location that is a distance of 20 times the depth of water at the pile location, to the maximum extent practicable. For the pile driving events acoustically measured, 100 percent of the data will be analyzed.

At a minimum, the methodology includes:

- For underwater recordings, a stationary hydrophone system with the ability to measure SPLs will be placed in accordance with NMFS most recent guidance for the collection of source levels.
- Hydroacoustic monitoring will be successfully conducted for at least 10 percent and up to 10 of each different type of pile and each method of installation (Table 13-1). The majority of the monitoring would occur during construction year 1, however certain pile types would not be installed until construction year 4. Therefore, hydroacoustic monitoring would occur during construction years 1 and 4. Hydroacoustic monitoring may occur during construction years 2 and 3 if year 1 hydroacoustic monitoring efforts are unsuccessful or if the collected data is deemed insufficient. Monitoring will occur at 33 ft from the noise; at a distance of 20 times the depth of water at the pile location (where practicable); and occasionally near the predicted ZOIs for Level B (behavioral) harassment. The resulting data set will be analyzed to examine and confirm SPLs and rates of transmission loss for each separate in-water construction activity. With NMFS concurrence, these metrics will be used to recalculate the limits of the Level A (PTS onset) shutdown and Level B (behavioral) disturbance zones for years 2 through 5 of the project, and to make corresponding adjustments in marine mammal monitoring of these zones. Hydrophones will be placed using a static line deployed from a stationary (temporarily moored) vessel. Locations of hydroacoustic recordings will be collected via GPS. A depth sounder and/or weighted tape measure will be used to determine the depth of the water. The hydrophone will be attached to a weighted nylon cord or chain to maintain a constant depth and distance from the pile area. The nylon cord or chain will be attached to a float or tied to a static line.

Table 13-1 Hydroacoustic Monitoring Summary

Pile type	*Count*	*Method of Install*	*Number Monitored*	*Construction Year*
31.5-inch Z-shaped Sheets	70 pair	Impact	7	4
22.5-inch Z-shaped Sheets	294 pair	Impact	10	1
31.5-inch Z-shaped Sheets	70 pair	Vibratory	7	4
22.5-inch Z-shaped Sheets	294 pair	Vibratory	10	1
42-inch Steel Pipe	35	Impact	4	4
30-Inch Steel Pipe	19	Impact	2	1
14-inch H-pile	372	Vibratory	10	1

- Each hydrophone (underwater) will be calibrated at the start of each action and will be checked frequently to the applicable standards of the hydrophone manufacturer.
- Environmental data would be collected, including but not limited to, the following: wind speed and direction, air temperature, humidity, surface water temperature, water depth, wave height, weather conditions, and other factors that could contribute to influencing the airborne and underwater sound levels (e.g., aircraft, boats, etc.).
- The chief inspector would supply the acoustics specialist with the substrate composition, hammer model and size, hammer energy settings and any changes to those settings during the piles being monitored, depth of the pile being driven, and blows per ft for the piles monitored.
- For acoustically monitored piles, data from the monitoring locations will be post-processed to obtain the following sound measures:
    - Maximum peak pressure level recorded for all the strikes associated with each pile, expressed in dB re 1 µPa. For pile driving, this maximum value will originate from the phase of pile driving during which hammer energy was also at maximum (referred to as Level 4).
    - From all the strikes associated with each pile occurring during the Level 4 phase these additional measures will be made:
        - mean, median, minimum, and maximum RMS pressure level in [dB re 1 µPa]
        - mean duration of a pile strike (based on the 90 percent energy criterion)
        - number of hammer strikes
        - mean, median, minimum, and maximum single strike SEL in [dB re μPa^2 s]
    - Cumulative SEL as defined by the mean single strike SEL + $10*\log_{10}$ (number of hammer strikes) in [dB re μPa^2 s].
    - Median integration time used to calculate SPL RMS.
    - A frequency spectrum (pressure spectral density) in [dB re μPa^2 per Hz] based on the average of up to eight successive strikes with similar sound. Spectral resolution will be 1 Hz, and the spectrum will cover nominal range from 7 Hz to 20 kHz.
    - Finally, the cumulative SEL will be computed from all the strikes associated with each pile occurring during all phases, i.e., soft start, Level 1 to Level 4. This measure is defined as the sum of all single strike SEL values. The sum is taken of the antilog, with $\log_{10}$ taken of result to express in [dB re μPa^2 s].

13.3 Reporting

13.3.1 Annual Reports

The Navy will submit an annual report within 90 days after each activity year, starting from May 14, 2023 (for the first annual report) or from the date when the previous annual report ended. Annual reports will detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine mammals that may have been harassed during the period of the report. Annual reports will also include results from acoustic monitoring detailed in Section 13.2 of the LOA application. NMFS would provide comments on the annual reports. The Navy will address NMFS comments and submit revisions within 30 days of receipt. If no comment is received from NMFS within 30 days, the annual report will be considered completed.

13.3.2 Final Report

A comprehensive summary report would be submitted to NMFS within 90 calendar days of the completion of acoustic measurements and marine mammal monitoring. The final report will synthesize the data recorded during hydroacoustic and marine mammal monitoring and estimate the number of marine mammals that may have been harassed through the entire project. The results would be summarized in graphical form and include summary statistics and time histories of sound values based upon the data from the activities monitored for this LOA period. Similar to the annual reports, NMFS would provide comments within 30 days after receiving this report, and the Navy would address the comments and submit revisions within 30 days of receipt. If no comment is received from NMFS within 30 days, the draft report would be considered as final.

13.3.3 Reporting Requirements

At a minimum, the annual and final reports will include:

- General data:
  - Date and time of activities.
  - Water conditions (e.g., sea state, tidal state).
  - Weather conditions (e.g., percent cover, visibility).
- Specific pile data for acoustically monitored piles:
  - Description of the activities being conducted.
  - Size and type of piles.
  - The machinery used for installation or removal.
  - The power settings of the machinery used for installation or removal.
- Specific acoustic monitoring information:
  - A description of the monitoring equipment.
  - The distance between hydrophone(s) and pile.
  - The depth of the hydrophone(s).
  - The physical characteristics of the bottom substrate where the piles were driven or extracted (if possible).
  - Acoustic data (per Section 13.2 above) for each pile monitored.
- Pre-activity observational survey-specific data:
  - Dates and time survey is initiated and terminated.
  - Description of any observable marine mammal behavior in the immediate area during monitoring.
  - If possible, the correlation to underwater sound levels occurring at the time of the observable behavior.
  - Actions performed to minimize impacts to marine mammals.
- During activity observational survey-specific data:
  - Description of any observable marine mammal behavior within shutdown and Level B (behavioral) harassment zones or in the immediate area surrounding these zones.
  - If possible, the correlation to underwater sound levels occurring at the time of this observable behavior.
  - Actions performed to minimize impacts to marine mammals.
  - Times when pile extraction is stopped due to presence of marine mammals within the shutdown zones and time when pile driving resumes.

- Post-activity observational survey-specific data:
  - Results, which include the detections of marine mammals, species and numbers observed, sighting rates and distances, and behavioral reactions within and outside of shutdown and Level B (behavioral) harassment zones.
  - A refined take estimate based on the number of marine mammals observed during the course of construction.

14 RESEARCH EFFORTS

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

The Navy is one of the world's leading organizations in assessing the effects of human activities in the marine environment, including marine mammals. From 2004 through 2013, the Navy has funded over $240 million specifically for marine mammal research. Navy scientists work cooperatively with other government researchers and scientists, universities, industry, and non-governmental conservation organizations in collecting, evaluating, and modeling information on marine resources. They also develop approaches to ensure that these resources are minimally impacted by existing and future Navy operations. It is imperative that the Navy's research and development (R&D) efforts related to marine mammals are conducted in an open, transparent manner with validated study needs and requirements. The goal of the Navy's R&D program is to enable collection and publication of scientifically valid research as well as development of techniques and tools for Navy, academic, and commercial use. Historically, R&D programs are funded and developed by the Navy's Chief of Naval Operations Energy and Environmental Readiness and Office of Naval Research, Code 322 Marine Mammals and Biological Oceanography Program. Primary focus of these programs since the 1990s is on understanding the effects of sound on marine mammals, including physiological, behavioral, and ecological effects.

The Office of Naval Research's current Marine Mammals and Biology Program trusts include, but are not limited to: (1) monitoring and detection research; (2) integrated ecosystem research, including sensor and tag development; (3) effects of sound on marine life (such as hearing, behavioral response studies, physiology [diving and stress], and Population Consequences of Acoustic Disturbance); and (4) models and databases for environmental compliance.

To manage some of the Navy's marine mammal research programmatic elements, the Navy developed the Living Marine Resources (LMR) R&D Program (http://www.lmr.navy.mil/) in 2011. The goal of the LMR R&D Program is to identify and fill knowledge gaps and to demonstrate, validate, and integrate new processes and technologies to minimize potential effects to marine mammals and other marine resources. Key elements of the LMR program include:

- Providing science-based information to support Navy environmental effects assessments for research, development, acquisition, testing, and evaluation as well as Fleet at sea training, exercises, maintenance, and support activities.
- Improving knowledge of the status and trends of marine species of concern and the ecosystems of which they are a part.
- Developing the scientific basis for the criteria and thresholds to measure the effects of Navy-generated sound.
- Improving understanding of underwater sound and sound field characterization unique to assessing the biological consequences resulting from underwater sound (as opposed to tactical applications of underwater sound or propagation loss modeling for military communications or tactical applications).
- Developing technologies and methods to monitor and, where possible, mitigate biologically significant consequences to LMR resulting from naval activities, emphasizing those consequences that are most likely to be biologically significant.

The Navy Natural Resources Management Program has invested in several marine resource surveys in and around NAVSTA Newport. This survey data will help provide a better understanding of marine mammals in the Bay; help support management of the resource; and support future mission readiness activities.

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 R&D efforts, and current research as previously described.

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

LETTER OF AUTHORIZATION

The U.S. Navy (Navy) and their designees are hereby authorized under section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1371(a)(5)(A)) to take marine mammals incidental to construction activities at Naval Station Newport, Rhode Island subject to the provisions of the MMPA and the Regulations Governing Taking Marine Mammals Incidental to U.S. Navy Construction Activities at Naval Station Newport, Rhode Island (50 CFR Part 217, Subpart R) (Regulations).

1. This Letter of Authorization (LOA) is valid from May 15, 2022 through May 14, 2027.

2. This LOA authorizes take incidental to the specified construction activities in the Navy LOA August 2021 application, associated with Bulkhead Replacement/Repairs at Naval Station Newport, Rhode Island, and described in the preamble to the Regulations. Hereafter (unless otherwise specified) the term "pile driving" is used to refer to both pile installation and pile removal.

3. General Conditions

   (a) A copy of this LOA must be in the possession of the Holder of the Authorization (Holder or Navy), supervisory construction personnel, lead protected species observers (PSOs), and any other relevant designees of the Holder operating under the authority of this LOA at all times that activities subject to this LOA are being conducted.

   (b) The species and/or stocks authorized for taking are listed in Table 1. Authorized take, by Level A and B harassment, is limited to the species and numbers listed in Table 1.

   (c) The taking by serious injury or death of any of the species listed in Table 1 or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this LOA. Any taking exceeding the authorized amounts listed in Table 1 is prohibited and may result in the modification, suspension, or revocation of this LOA.

   (d) The Holder must ensure that construction supervisors and crews, the monitoring team, and relevant Navy staff are trained prior to the start of all activities subject to this LOA, so that responsibilities, communication procedures, monitoring protocols, and operational procedures are clearly understood. New personnel joining during the project must be trained prior to commencing work.

4.e Mitigation Requirementse

(a)e The Holder must employ PSOs and establish monitoring locations as described ine section 5 of this LOA and the Marine Mammal Monitoring Plan. The Holder muste monitor the project area to the maximum extent possible based on the requirede number of PSOs, required monitoring locations, and environmental conditions.e

(b)e Monitoring must take place from 30 minutes prior to initiation of pile drivinge activity (*i.e.*, pre-start clearance monitoring) through 30 minutes post-completione of pile driving activity.e

(c)e If a marine mammal is observed entering or within the shutdown zones indicatede in Table 2, pile driving activity must be delayed or halted. Pile driving must bee commenced or resumed as described in condition 4(g) of this LOA.e

(d)e The Holder must establish shutdown zones for all pile driving activities (Table 2).e Shutdown zones are limited to 150 m from the point of noise generation. Anye remaining area within estimated Level A harassment zones shall be considerede part of the "disturbance zone," i.e., the Level B harassment zone and, wheree present, the Level A harassment zone (PTS onset) beyond 150 m from the pointe of noise generation. For activities where the estimated Level A (PTS onset)e harassment zones are smaller than 150 m, the disturbance zone shall include thee entire region of influence (ROI), i.e., estimated Level A and Level B harassmente zones). Work may proceed without cessation while marine mammals are in thee disturbance zone and marine mammal behavior within the disturbance zone shalle be monitored and documented.e

(e)e The Navy will conduct monitoring to include the area within the Level Be harassment zones (areas where SPLs are equal to or exceed the 160 dB rmse threshold for impact driving and the 120 dB rms threshold during vibratory pilee driving) (see Disturbance Zones in Table 2).e

(f)e Pre-start clearance monitoring must be conducted during periods of visibilitye sufficient for the lead PSO to determine that the shutdown zones indicated ine Table 2 are clear of marine mammals. Pile driving may commence following 30e minutes of observation when the determination is made that the shutdown zonese are clear of marine mammals.e

(g)e If pile driving is delayed or halted due to the presence of a marine mammal, thee activity may not commence or resume until either the animal has voluntarilye exited and been visually confirmed beyond the shutdown zone indicated in Tablee 2 or 15 minutes have passed without re-detection of the animal.e

(h)e The Holder must use soft start techniques when impact pile driving. Soft starte requires contractors to provide an initial set of three strikes at reduced energy,e

followed by a 30-second waiting period, then two subsequent reduced-energy strike sets. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer.

(i)a Pile driving activity must be halted (as described in condition 4(c) of this LOA)a upon observation of either a species for which incidental take is not authorized ora a species for which incidental take has been authorized but the authorized numbera of takes has been met, entering or within the harassment zone (as shown in Tablea 2).a

(j)a The Holder, construction supervisors and crews, PSOs, and relevant Navy staffa must avoid direct physical interaction with marine mammals during constructiona activity. If a marine mammal comes within 10 meters of such activity, operationsa must cease and vessels must reduce speed to the minimum level required toa maintain steerage and safe working conditions, as necessary to avoid directa physical interaction.a

(k)a Should environmental conditions deteriorate such that marine mammals withina the entire shutdown zone would not be visible (*e.g.*, fog, heavy rain, night), thea Holder shall delay pile driving and removal until observers are confident marinea mammals within the shutdown zone could be detected.a

5.a Monitoring Requirementsa

(a) Marine Mammal monitoring must be conducted in accordance with the conditions in this section and the Marine Mammal Monitoring Plan. The Navy shall submit a Marine Mammal Monitoring Plan to NMFS for approval in advance of construction.

(b)a Monitoring must be conducted by qualified PSOs, in accordance with thea following conditions:a

(i)a PSOs must be independent (*i.e.*, not construction personnel) and have noa other assigned tasks during monitoring periods.a

(ii)a At least one PSO must have prior experience performing the duties of aa PSO during construction activity pursuant to a NMFS-issued incidentala take authorization.a

(iii)a Other PSOs may substitute other relevant experience, education (degree ina biological science or related field), or training for prior experiencea performing the duties of a PSO during construction activity pursuant to aa NMFS-issued incidental take authorization.a

(iv)e Where a team of three or more PSOs is required, a lead observer ore monitoring coordinator must be designated. The lead observer must havee prior experience performing the duties of a PSO during constructione activity pursuant to a NMFS-issued incidental take authorization.e

(v)e PSOs must be approved by NMFS prior to beginning any activity subjecte to this LOA.e

(c)e The Holder must establish the following monitoring locations. For all pile drivinge activities, a minimum of one PSO must be assigned to each active pile drivinge location to monitor the shutdown zones. Trained PSOs will be placed at the beste vantage point(s) practicable such as on nearby breakwaters, Gould Island,e Coddington Point, or Taylor Point. Visual monitoring will be conducted by, at ae minimum, by two PSOs. It is assumed that two to three PSOs would be sufficiente to monitor the respective ROIs given the abundance of suitable vantage points.e Any activity that would result in threshold exceedance at or more than 1,000 me would require a minimum of three PSOs to effectively monitor the entire ROI.e However, additional monitors may be added if warranted by site conditions and/ore the level of marine mammal activity in the area.e

(d)e PSOs must record all observations of marine mammals, regardless of distancee from the pile being driven, as well as the additional data indicated in section 6 ofe this LOA.e

(e)e Acoustic monitoring must be conducted in accordance with the Acoustice Monitoring Plan. The Navy must conduct hydroacoustic data collection (sounde source verification and propagation loss) in accordance with a hydroacoustice monitoring plan that must be approved by NMFS in advance of construction.e

(f)e The shutdown/disturbances zones (Table 2) may be modified with NMFS'e approval following NMFS' acceptance of an acoustic monitoring report.e

6. Reporting Requirements

(a)e The Holder must submit its annual draft report(s) on all monitoring conductede under this LOA within 90 calendar days of the completion of monitoring as welle as the 5-year comprehensive summary report at the end of the project. Thee report(s) will detail the monitoring protocol and summarize the data recordede during monitoring of each bulkhead section of the project. Final annual reportse (each portion of the project and comprehensive) must be prepared and submittede within 30 days following resolution of any NMFS comments on the draft report.e If no comments are received from NMFS within 30 days of receipt of the drafte

report, the report must be considered final. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

(b)e All draft and final monitoring reports must be submitted toe *PR.ITP.MonitoringReports@noaa.gov* and *ITP.Egger@noaa.gov*.

(c)e The marine mammal report must contain the informational elements described ine the Monitoring Plan and, at minimum, must include:e

(i)e Dates and times (begin and end) of all marine mammal monitoring;e

(ii)e Construction activities occurring during each daily observation period,e including:e

A.e the number and type of piles that were driven or removed and bye what method (*i.e.*, impact or vibratory);e

B.e Total duration of driving time for each pile (vibratory driving) ande number of strikes for each pile (impact driving); ande

(iii)e PSO locations during marine mammal monitoring;e

(iv)e Environmental conditions during monitoring periods (at beginning ande end of PSO shift and whenever conditions change significantly),e including Beaufort sea state and any other relevant weather conditionse including cloud cover, fog, sun glare, and overall visibility to thee horizon, and estimated observable distance;e

(v)e Upon observation of a marine mammal, the following information:e

A.e Name of PSO who sighted the animal(s) and PSO location ande activity at time of sighting;e

B.e Time of sighting;e

C.e Identification of the animal(s) (*e.g.*, genus/species, lowest possiblee taxonomic level, or unidentified), PSO confidence in identification,e and the composition of the group if there is a mix of species;e

D.e Distances and location of each marine mammal observed relativee to the pile being driven or removed for each sighting;e

E.e Estimated number of animals (min/max/best estimatc);e

F.e Estimated number of animals by cohort (adults, juveniles,e neonates, group composition, etc.);e

G.e Animal's closest point of approach and estimated time spente within the harassment zone;e

H.e Description of any marine mammal behavioral observationse (e.g., observed behaviors such as feeding or traveling), includinge an assessment of behavioral responses thought to have resultede from the activity (e.g., no response or changes in behavioral statee such as ceasing feeding, changing direction, flushing, ore breaching);e

(vi)e Number of marine mammals detected within the harassment zones, bye species; ande

(vii)e Detailed information about any implementation of any mitigatione triggered (*e.g.*, shutdowns and delays), a description of specific actionse that ensued, and resulting behavior of the animal, if any;e

(d)e The Holder must submit all PSO datasheets and/or raw sighting data with thee draft reports referenced in condition 6(a) of this LOA.e

(e)e The acoustic monitoring report must contain the informational elements describede in the Acoustic Monitoring Plan and, at minimum, must include:e

(i)e Hydrophone equipment and methods: recording device, sampling rate,e distance (m) from the pile where recordings were made; depth of watere and recording device(s);e

(ii)e Type and size of pile being driven, substrate type, method of drivinge during recordings (e.g., hammer model and energy), and total pile drivinge duration;e

(iii)e Whether a sound attenuation device is used and, if so, a detailede description of the device used and the duration of its use per pile;e

(iv)e For impact pile driving (per pile): Number of strikes and strike rate; depthe of substrate to penetrate; pulse duration and mean, median, and maximume sound levels (dB re: 1 µPa): root mean square sound pressure levele (SPLrms); cumulative sound exposure level (SELcum), peak sounde pressure level (SPLpeak), and single-strike sound exposure level (SELs-s);e

(v)e For vibratory driving/removal (per pile): Duration of driving per pile;e mean, median, and maximum sound levels (dB re: 1 µPa): root meane square sound pressure level (SPLrms), cumulative sound exposure levele (SELcum) (and timeframe over which the sound is averaged); ande

(vi)o One-third octave band spectrum and power spectral density plot.o

(f)o Reporting injured or dead marine mammals:o

In the event that personnel involved in the construction activities discover ano injured or dead marine mammal, the Holder must report the incident to the Officeo of Protected Resources (OPR), NMFS (*PR.ITP.MonitoringReports@noaa.gov* and *ITP.Egger@noaa.gov*) and to the Greater Atlantic Region New England/Mid-Atlantic Regional Stranding Coordinator (978-282-8478 or 978-281-9291) aso soon as feasible. If the death or injury was clearly caused by the specified activity,o the Holder must immediately cease the activities until NMFS OPR is able too review the circumstances of the incident and determine what, if any, additionalo measures are appropriate to ensure compliance with the terms of this LOA. Theo Holder must not resume their activities until notified by NMFS.o

The report must include the following information:o

(i)o Time, date, and location (latitude/longitude) of the first discovery (ando updated location information if known and applicable);o

(ii)o Species identification (if known) or description of the animal(s) involved;o

(iii)o Condition of the animal(s) (including carcass condition if the animal iso dead);o

(iv)o Observed behaviors of the animal(s), if alive;o

(v)o If available, photographs or video footage of the animal(s); ando

(vi)o General circumstances under which the animal was discovered.o

7.o This Authorization may be modified, suspended or revoked if the Holder fails to abide byo the conditions prescribed herein (including, but not limited to, failure to comply witho monitoring or reporting requirements), or if NMFS determines: (1) the authorized takingo is likely to have or is having more than a negligible impact on the species or stocks ofo affected marine mammals or (2) the prescribed measures are likely not or are noto effecting the least practicable adverse impact on the affected species or stocks and theiro habitat.o

DAMON RANDALL.KIMBERLY.BETH.1365821093

Digitally signed by DAMON RANDALL.KIMBERLY.BETH.1365821093
Date: 2022.01.26 14:53:15 -05'00'

Kimberly Damon-Randall,
Director, Office of Protected Resources
National Marine Fisheries Service

Table 1. Authorized Incidental Take.

Common Name	Scientific Name	Stock	Level A Harassment	Level B Harassment
Atlantic White-sided Dolphin	*Lagenorhynchus acutus*	Western North Atlantic	0	48
Common Dolphin	*Delphinus delphis*	Western North Atlantic	0	140
Harbor Porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy	4	21
Harbor Seal	*Phoca vitulina*	Western North Atlantic	78	900
Gray Seal	*Halichoerus grypus*	Western North Atlantic	17	374
Harp Seal	*Pagophilus groenlandicus*	Western North Atlantic	6	74
Hooded Seal	*Cystophora cristata*	Western North Atlantic	0	20

Table 2. Shutdown and Harassment Zones.

Pile Type	Installation Method	Pile Diameter	Shut Down Zone For Cetaceans	Shut Down Zone for Pinnipeds	Disturbance Zone
Steel pipe	Impact	30-in	150 m	150 m	2,500 m
	Impact	42-in	150 m	50 m	2,500 m
Steel H	Vibratory	14-in	10 m	10 m	ROI
Z-Shaped Steel Sheet	Vibratory	22.5-in	30 m	10 m	ROI
	Impact	22.5-in	150 m	150 m	2,500 m
	Vibratory	31.5-in	20 m	10 m	ROI
	Impact	31.5-in	150 m	150 m	2,500 m

*ROI = region of influence and is the full extent of potential underwater noise impact (Level A and Level B calculated harassment zones).

CONTRACT NUMBER: N40085-28-D-1157	**REQUEST FOR INFORMATION**		RFI NUMBER: 15
CONTRACT TITLE: BULKHEAD REPAIRS S45N			
PRIME CONTRACTOR: DOYON PROJECT SERVICES		SUBCONTRACTOR/SUPPLIER: NA	
SUBJECT/TITLE OF RFI: Request Clarfications of the CATEX Document			
DRAWING(S): NA	DETAIL(S): NA	SPECIFICATION: NA	CPM ACTIVITY NUMBER: NA
COST EFFECT:	INCREASE: ☐	DECREASE: ☐	NONE: ☐

INFORMATION REQUESTED & RECOMMENDED SOLUTION:

Reference CATEX Document "Record of Categorical Exclusions"

Page 8 - Reference "Letter of Authorization to Incidentally Take Marine Mammals". The paragraph states that a final ruling will be issued in Late 2021 or early 2022.

1 .What is the final rule?

2. Will the final rule alter what is in the CATEX document?

Date Response Required By: ASAP Date: 8-15-2022 Signature: LuAnn Watters

From:
To: Field Office Name Code
RECOMMENDATION:

Date: Signature:

From: Field Office Name
To: Prime Contractor
REPLY:

The NMFS LOA is attached.

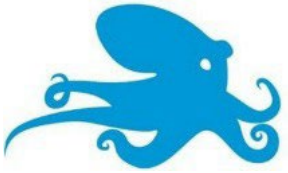
Date: 8/29/22 Signature: L. Lattuca

The RFI system is intended to provide an efficient mechanism for responding to contractor's request for

PROTECTED SPECIES OBSERVER SIGHTING FORM

Project Name:

Date:	
Observer Name:	
Observer Location:	
Construction Activity:	
Monitoring Start Time:	
Activity Start Time:	
Activity End Time:	
Monitoring End Time:	
Weather/Beaufort Sea State:	



Sighting Event #	Species/ # of Individuals Sex and Age class when possible	Time/Duration of sighting event (24hr)	Latitude & Longitude at time of sighting	Distance to animal from activity (ft.)	Distance to animal from from PSO (ft.)	Photos Taken (Y or N)	Project Shutdown or delay required (Y or N)
Animal Characteristics: (list at least 3)							
Observed Animal Behavior:							
Estimated amount of time animal spent in Level A or B harassment Zones while noise generating activities underway:							
Project Shutdown or Delay Mitigation Steps Completed:							
Other Human activity in Area:							

Attachment 4: PSO Incident Form

PROTECTED SPECIES INCIDENT FORM

Sighting Event #	Event Date (mm/dd/yy)	Event Time 24 hr.	Construction Activity	Latitude	Longitude	Approx. Distance from Species
						ft.

Species Name	# Species (same)	

Species Condition Description: circle one				
Dead	Alive	Alive, Injured	Alive, Entangled	Other, comment:

Physical Description of animal: Approx. size (ft.), distinctive features, injuries, entanglements, behavior, etc.

Operations Halted? Circle one		End Event Time 24 hr.	Total Time Operations Halted	Sighting/Interaction Reported?	
Y	N		hrs.	Y	N

Injured/dead protected species,
CONTACT IMMEDIATELY

Office of Protected Resources (OPR), NMFS
(PR.ITP.MonitoringReports@noaa.gov and *ITP.Egger@noaa.gov*

AND

Greater Atlantic Region New England/Mid- Atlantic
Regional Stranding Coordinator
(978-282-8478 or 978-281-9291)

Hydroacoustic Monitoring Log

Fathom Resources, LLC

Date: _____

Project Name: _____

Observer Name:	
Observer Location: Lat/Long	
Start Time of Pile Driving:	
End Time of Pile Driving:	
Beaufort Sea State:	
Wind:	
Humidity:	
Temperature:	
Tide State:	
Water Current State:	
Other Human Activity in Area:	
Observations/Notes:	

Post Data to be processed:	
Maximum peak pressure level	**recorded for all the strikes associated with each pile, expressed in dB re 1 µPa**
From all the strikes associated with each pile occurring during the level 4 phase these additional measures will be made	• **mean, median, minimum, and maximum RMS pressure level in [dB re 1 µPa]** • **mean duration of a pile strike (based on the 90 percent energy criterion)** • **number of hammer strikes** • **mean, median, minimum, and maximum single strike SEL in [dB re µPa2 s]**
Cumulative SEL	**as defined by the mean single strike SEL + 10•1og10 (number of hammer strikes) in [dB re µPa2 s].**
Median integration time used to calculate SPL RMS.	
A frequency spectrum (pressure spectral density) in [dB re µPa2 per Hz]	**based on the average of up to eight successive strikes with similar sound. Spectral resolution will be 1 Hz, and the spectrum will cover nominal range from 7 Hz to 20 kHz.**
the cumulative SEL	**will be computed from all the strikes associated with each pile occurring during all phases, i.e., soft start, Level 1 to Level 4. This measure is defined as the sum of all single strike SEL**

Hydroacoustic Monitoring Gear

Gear

Item	Amount
Larson Davis Sound Advisor Sound Meter. Model 831C	2
Hydrophone, 20 m cable, 1 Hz-170 kHz, -211dB ±3dB re 1V/uPa,	2
Larson Davis Adapter, BNC to 1/2" mic thread adapter, 18 pF with shorting cap.	1
Pistonphone Calibrator, for 1", 1/2" and 1/4" microphone, 114 dB @ 250Hz.	1
Pistonphone coupler for TC4013 hydrophone	1

SOUNDADVISOR™ SOUND LEVEL METER & KITS

LARSON DAVIS
A PCB DIVISION

larsondavis.com/soundadvisor | 1 716 936 8243

SOUNDADVISOR™

- Environmental noise assessment
- Noise reduction validation
- Product quality control
- Spectral noise analysis
- In-situ sound power measurements
- Code enforcement

SOUNDADVISOR™

MODEL 831C SOUND LEVEL METER

The Model 831C SoundAdvisor is designed to make noise measurement easy. Due to its color display, connectivity, extensive software features, and small form factor the SoundAdvisor is an ideal choice for handheld operation. Attended measurements are simplified, with the ability to control and monitor data via any PC or mobile device with a standard web interface. Designed with the acoustic professional in mind, the SoundAdvisor offers an elegant solution for complex needs in an easy-to-use system.

MEASUREMENTS SIMPLIFIED

- **Connectivity Is Key** – Cellular, WiFi, and wired networking are all available to you when using the SoundAdvisor. The meter can even serve as its own WiFi hotspot.
- **Many Platforms, Same Controls** – Whether you are setting up a test on the meter, checking in remotely from your laptop, or receiving an alert to your smartphone, you'll be working with the same interface and menus across all platforms.
- **Customizable for Your Application** – From complete outdoor monitoring kits to a low noise option to automatic event detection, the SoundAdvisor is designed to help meet your testing needs.
- **LCD Color Interface** – A full-color user interface allows you to interpret data more easily, right from the meter.

TECHNICALLY OPTIMIZED

As with any device from Larson Davis, a thoughtful design process ensures that your needs are met, from international standards to functionality.

- IEC 61672-1:2013, ANSI S1.4-2014 Class 1 integrating sound level meter
- Real-time frequency analysis in 1/1 and 1/3 octave bands, compliant with IEC 61260:2014 and ANSI S1.11-2014 Class 1
- >120 dB dynamic range
- 2 GB internal memory, expandable by USB
- Full range AC output
- Available low noise option (831C-LOWN)

CLASS 1

SOLVING YOUR CHALLENGES

The Larson Davis SoundAdvisor Sound Level Meter is extremely versatile, performing the functions of several instruments. It puts the combined features of a precision Class 1 sound level meter, environmental noise analyzer, and a real-time frequency analyzer in the palm of your hand or on a network. It expands upon the Larson Davis tradition of delivering value, innovation, and function in a rugged, single-handed, expandable package and is backed by a 2-year factory warranty, 24-hour application support, total customer satisfaction, and accredited factory service/calibration.

SOLUTIONS WITH YOUR METER

- **Easy Setup and Data Download** – SoundAdvisor offers setup directly on the meter's keypad, touchscreen, or via web interface, plus streamlined export of data to Excel®.
- **ANY LEVEL™** – Never miss a key sound metric with the ability to view and store multiple time weightings (Slow, Fast, and Impulse) and frequency weightings (A, C, and Z) simultaneously.
- **Flexibility for Integration** – Designed to allow integration into a larger or customized solution, SoundAdvisor allows connection of accessories, internal clock for accurate data synchronization, and local language compatibility.

SOLUTIONS WITH YOUR OUTDOOR KIT

- **Data on Demand** – Access the meter from any location to make modifications to the setup, view current noise levels, and modify alerts.
- **Instant Alerts** – Receive immediate notification of noise events and use the recorded sound files to evaluate the cause.
- **Long Term Remote Power** – Lithium Iron Phosphate batteries paired with a solar panel offer a continuous, sustainable means to keep your measurements running.
- **Avoid Trips To the Field** – With access to measurements, event alerts, and continuous power, you can spend time in the office, rather than traveling to reach remote locations.

Cellular WiFi Ethernet USB

CONNECTIVITY

- **Cellular, WiFi, or Wired Networking** – Select your network by choosing what to plug into the USB port. You can choose cellular by using a Sierra Wireless gateway for mobile or permanent applications, WiFi for close proximity wireless, and wired (Ethernet) for permanent locations. A USB hub can be used to support multiple USB devices.
- **Expandable USB Memory** – Easily expand the 831C memory by adding a USB memory stick. Data is written directly to the USB memory so it's always available and the data is protected if the USB memory is accidentally removed.

SOUNDADVISOR™ NOISE MONITORING SYSTEMS

Larson Davis Noise Monitoring Systems offer you access to measurements and event alerts from any Internet connected device, allowing you to spend time in the office rather than traveling to remote locations. For the life of your system, as part of our commitment to Total Customer Satisfaction, we offer you free firmware upgrades to keep your system up-to-date as well as support from our team of trained application engineers. We know what it takes to make your measurements.

PORTABLE NOISE MONITORING

MODEL NMS044

The SoundAdvisor™ Portable Noise Monitoring System Model NMS044 is a completely wireless solution designed to run indefinitely on solar power, allowing you to both take measurements and view them 24 hours a day, seven days a week. A rugged, portable Pelican® case houses the Model 831C sound level meter, 12 V battery, power supply, and gateway (modem) as well as a pole supporting your microphone. Wherever remote noise monitoring takes you, Model NMS044 offers a range of capabilities in a portable package.

With decades of experience in creating outdoor noise monitoring solutions, Larson Davis has created the NMS044 as a system for applications such as:

- **Consultancy Projects** – The portability of NMS044 offers an ideal solution for consultants performing noise studies for different customers in different locations on a regular basis
- **Short-Term Airport Noise Monitoring** – Airport noise is frequently a complaint for those living nearby and in landing patterns. The NMS044 allows airports to monitor noise issues as they arise in specific locations.
- **Short-Term Construction Noise Monitoring** – Monitoring during a building period is often of a short-term commitment that recurs with each new project. When one job is complete, pack up the NMS044 and move to the next location.

OPTIONS DETAIL BATTERY AND SOLAR PANEL POWER CHOICES		
Model Number [1]	**Batteries**	**Portable Solar Panel**
NMS044-SLA60	35 Ah SLA battery (lower cost)	60 W
NMS044-SLA100		100 W
NMS044-LFP60	45 Ah LiFePo [2] battery (lighter weight)	60 W
NMS044-LFP100		100 W

[1] For use in North America add "-U" to model, for Rest of World add "-E" to model
[2] LiFePo battery cannot be shipped by common carrier without a hazardous material shipping license

NMS044 INCLUDES	
SoundAdvisor 831C	Sound level meter, class 1
831C-LOG	Data logging firmware option
831C-ELA	Event processing option
831C-SW	USB driver for gateway
EPS044	Weatherproof outdoor hard case
COM-RV50X	4G LTE gateway
PRM2103-FF	Outdoor preamplifier with calibration check
EPS2116	Outdoor microphone and preamplifier protection
SLP001 or SLP002	60 W or 100 W solar panel
BAT019 or BAT020	45 Ah LiFePro battery or 35 Ah SLA battery
PSA039	AC power supply
Misc	Cables and accessories
Communication	4G LTE and optional WiFi or Ethernet
Software	G4 LD Utility

- **24/7 Network Access** – Log in from your computer, smartphone, or other mobile device to engage directly with the meter at your remote location. Make updates, receive alerts, change test parameters, check microphone calibration, and download data with ease.
- **Remote Power** – Either solar panel or line power offers continuous, sustainable means to keep your measurements running
- **Time Matters** – Each system automatically syncs with Internet-based time sources, keeping your data accurate with time zone or Daylight Savings Time changes
- **Real-Time Alerts** – Receive email or texts with data and sound recordings when set noise limits are exceeded. Allows quick response to compliance concerns and listening to sounds for source identification.

PERMANENT, LONG-TERM NOISE MONITORING

MODEL NMS045

The SoundAdvisor Permanent Noise Monitoring System Model NMS045 is available in a variety of configurations to meet your long-term monitoring needs. Model NMS045 shares many of the same benefits as the Model NMS044, from 24/7 connectivity to continuous power capabilities, designed to simplify your testing. Now, the key elements of the portable system are available in a permanent setup, encased in a fiberglass enclosure mounted to a permanently placed pole. When you need to monitor the same location long-term, the NMS045 is the right choice for you.

Larson Davis knows permanent noise monitoring requirements vary. We have made the NMS045 highly flexible yet still easy to use. It is ideal for applications such as:

- **Permanent Airport Noise Monitoring** – NMS045 allows airports to meet their requirements for long term noise monitoring, delivering a broad scope of measurement data continuously
- **Long-Term Construction Noise Monitoring** – When construction will be a long term long project, NMS045 is a permanent monitoring solution offering durability and protection against vandalism and damage, so your measurements can continue uninterrupted
- **Permanent City Noise Monitoring** – Whether you are monitoring near a bridge, busy street, factory, or nightclub, NMS045 helps you continuously measure noise levels, providing the data to create a more pleasant and ordinance-compliant community

CONFIGURABLE OPTIONS	
Power	Weather sensor
Battery	1 or 2 batteries (12 V) can be either • 45 Ah LiFePo (BAT019-045) • 35 Ah SLA (BAT020-045)
Mounting	Tilt-down pole (TR019), wooden pole, or wall
Communication	4G LTE gateway, Ethernet or WiFi
Weather sensor	Optional wind or full meteorological sensor

NMS045 INCLUDES	
SoundAdvisor 831C	Sound level meter, class 1
831C-LOG	Data logging firmware option
831C-ELA	Event processing option
831C-SW	USB driver for gateway
EPS045	Weatherproof outdoor hard case
PRM2103-FF	Outdoor preamplifier with calibration check
EPS2116	Outdoor microphone and preamplifier protection
Misc	Cables and accessories
Communication	4G LTE and optional WiFi or Ethernet
Software	G4 LD Utility

CAL+ PLUS

Complete multi-point factory calibrations

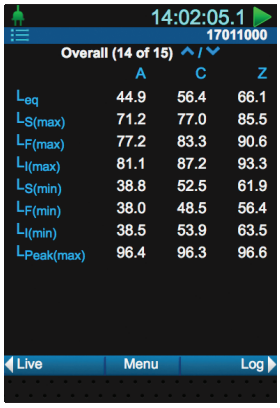
USING THE SOUNDADVISOR™

STANDARD FEATURES

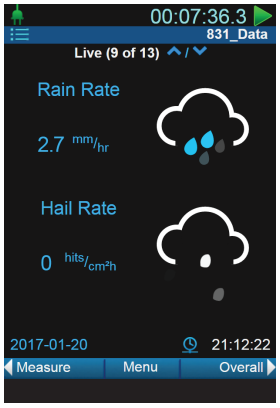
- **Web Interface** – Control the SoundAdvisor and view data from any device that runs a web browser.
- **NTP Time Sync and GPS** – Network Time Protocol automatically selects the most accurate clock from several sources and synchronizes the meter for accurate measurement times.
- **External Batteries** – Power directly from 12 V batteries for efficient power usage and long run times.
- **Built-In Power Management** – Safely power the meter off based upon battery voltage. Compatible with solar systems.
- **ANY LEVEL™** – Measure levels simultaneously.
- **Run Modes** – Control how and when the SoundAdvisor will operate to best match measurement conditions. Choices include a manual mode; stop after a predetermined period of time; run continuously with automatic calibration check and file save; and defined timers.

SUPPORTED PC SOFTWARE

- **G4 LD Utility** [INCLUDED] – PC software that fully supports SoundAdvisor features, including sound level meter control, in-the-field firmware and option upgrades, graphical view of time history, data export to spreadsheet, and audio playback.
- **DNA** [OPTIONAL] – The analysis, post-processing, and reporting tool for sound and vibration measurements. DNA delivers enhanced analysis capability, sound playback, and graphical reporting. Graphs can be annotated and shared amongst multiple users working with DNA reader software.
- **Software Development Kit (SDK)** [OPTIONAL] – Toolkit for developing custom applications in Microsoft Windows® or Linux® for the Model 831C



ANY LEVEL parameter display



831C-WTHR Datalogging

COMMON FIRMWARE OPTIONS

When performing noise surveys, it is important to have a fully capable sound level meter at your fingertips to capture all of the essential data. SoundAdvisor is available with a variety of firmware options to help you achieve your testing goals the first time.

- **Octave Band Analysis 831C-OB3** – Simultaneous real-time measurement of 1/1 and 1/3 octave Leq, Lmax, Lmin along with broadband parameters.
- **Logging 831C-LOG** – Select Time History logging periods as short as 2.5 ms to a full 24 hours. Additional parameters such as battery condition, microphone performance, and meteorological data (831C-WTHR) can be recorded.
- **Event Detection and Measurement History 831C-ELA** – Define an Event in terms of threshold level, duration, hysteresis, and continuation period.
- **Sound Recording 831C-SR** – Record audio files in a raw or compressed format to determine the source of the noise event.
- **Direct USB Support for RV50X Gateway 831C-SW** – Connect the SoundAdvisor by USB to a wireless gateway to create a highly portable noise monitor.
- **Scheduling Tools 831C-SCH** – Take control of your meter by scheduling run times, modem usage, and triggers. Control who gets alerts and notifications and when.
- **Fast Fourier Transform 831C-FFT** – Connect your meter to a microphone or uniaxial accelerometer to perform FFT Analysis for sound and vibration. Useful in identifying key frequencies of a signal, FFT is ideal for machinery troubleshooting, tone detection, and noise source identification.
- **Reverberation Time Measurements 831C-RA** – Make Reverberation Time measurements in compliance with ISO 3382-2 or ASTM 2235-04 standards. Automatic measurement grading and quality indicators offer confidence in your measurement data.

SOUNDADVISOR™ OPTIONS

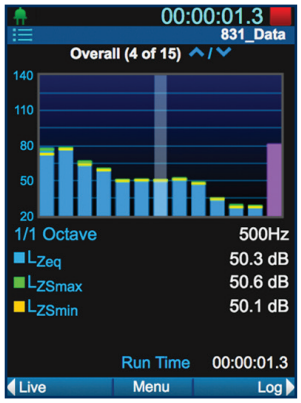
OCTAVE BAND ANALYSIS

831C-OB3

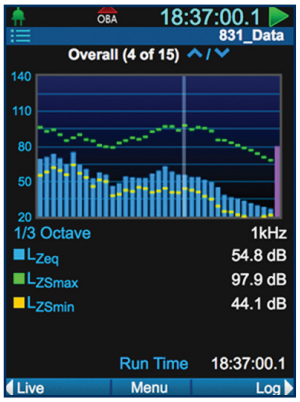
In many applications, it is important to acquire both the broadband level and spectral content of noise data. With spectral information, the source and content of the measured level can be better understood. Constant percentage bandwidth filters (1/1 or 1/3 octave) best approximate human perception of sound.

Option 831C-OB3 firmware enables simultaneous real-time measurement of 1/1 and 1/3 octave Leq, Lmax, Lmin along with all the ANY LEVEL™ broadband parameters. Option 831C-OB3 is compliant with IEC 61260:2014 Class 1 and ANSI S1.11-2014 Class 1 standards covering the entire frequency range of human hearing: 6.3 Hz to 20 kHz for 1/3 octave bands.

When 831C-OB3 is combined with Time History Logging (831C-LOG) or Automatic Event Detection and Event History (831C-ELA), it is possible to review the frequency content of logged data or specific events.



1/1 Octave Display



1/3 Octave Display

LOGGING

831C-LOG

The Model 831C can be used to record the evolution of sound pressure level over time as a Time History (TH). The Time History is then used to profile the observation period, which can vary from several seconds to continuous monitoring.

With the addition of Time History Logging Firmware (831C-LOG), users can pre-select from logging periods as small as 20 ms to a full 24 hours. Parameter selections consist of familiar acoustic metrics as well as non-acoustic metrics, such as battery condition, outdoor microphone performance, and meteorological data (831C-WTHR).

LOGGED FOR OBA FILTER

(Selected Frequency and Time Weighting Parameters for 1/1 and 1/3 Octaves)

- L_{eq}
- L_{max}
- L_{min}
- SPL

LOGGED FOR A, C, AND Z WEIGHTINGS (VARIABLE W)

- L_{weq}
- L_{wpeak}
- L_{wSmax}
- L_{wFmax}
- L_{wImax}
- L_{wSmin}
- L_{wFmin}
- L_{wImin}
- L_{wS}
- L_{wF}
- L_{wI}

OTHER PARAMETERS

- L_{Ceg} - L_{Aeg}
- L_{leg} - L_{Aeg}
- Statistics (Ln)
- Battery
- Temperature
- External Power
- Wind Speed
- Gust Direction
- Gust Speed
- Avg Temp
- Max Temp
- Min Temp
- Avg Humidity
- Max Humidity
- Min Humidity

MEASUREMENT HISTORY

831C-ELA

While Time Histories are typically logged at one sample per second, longer- term averages are often useful to see trends, e.g., 10 minute or hourly averages. 831C-ELA firmware enables Measurement History (MH) and logs these parameters similar to Time History (TH) over a longer interval time. MH and TH can run together simultaneously or independently.

Data for each measurement or location is saved in a unique MH record and may include the Leq, Lmax, Lmin, SPL, and statistical distribution of the SPL (Ln). A complete set of MH records then can be stored in a single measurement that keeps all the noise survey data in a single file. Finally, an automated sound recording at the beginning of each MH period can be achieved with 831C-SR firmware.

DATA	PARAMETERS			NOTES
Averages	Leq	LE		
Sound	Lmax	Lmin	Lpeak	
Occurrence Date & Time	Lmax	Lmin	Lpeak	
Temperature	Avg	Max	Min	
Relative Humidity	Avg	Max	Min	
Wind Speed	Avg	Max	Min	
1/3 Octaves	Leq	Lmax	Lmin	w/ 831C-OB3
1/1 Octaves	Leq	Lmax	Lmin	w/ 831C-OB3
Date & Time	Date	Time		
Measurement Time	Run Duration	Run Time	Pause Time	
GPS	Lat	Lon	Elevation	w/ 831-GPS
Other	Exceedance	6 Ln		

AUTOMATIC EVENT DETECTION AND ALERTS

831C-ELA

In the Model 831C, events are defined as one of the following:

- Exceedance of a fixed threshold level for a minimum duration
- Exceedance of a dynamic threshold level for a minimum duration
- External trigger set by the digital input signal

With 831C-ELA firmware, event definition is defined by you – including threshold level, duration, and event continuation period when the SPL drops below the threshold level for a specific period of time. Triggering status icons identify event progression and qualification (see graph above).

The Model 831C can automatically generate an email alert to provide fast notice of any noise exceedance. The event alerts can be sent to a user configurable list of email addresses or by text message using an email to MMS gateway. Email event sound recording in conjunction with option 831C-SR.

ADDED FUNCTIONALITY WITH 831C-ELA OPTION	
With Option	Description
831C-OB3	Frequency analysis of the event
831C-LOG	Record an independent time history of the event including filters when combined with 831C-OB3
831C-SR	Record event audio in .wav or compressed file

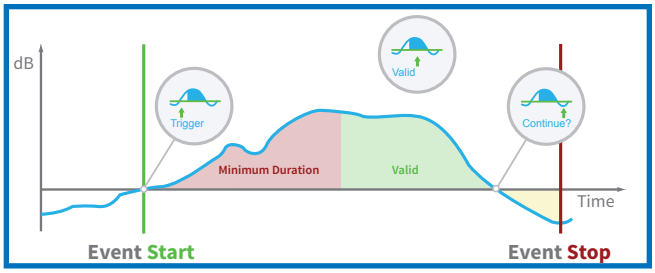
SCHEDULING TOOLS

831C-SCH

Data and alerts are often needed only on certain days or specific times. With 831C-SCH firmware, schedule run/stop times, modem usage, and alert type and recipient. Together with the optional event feature, 831C-ELA, trigger levels and alert recipient can be adjusted for time of day or day of the week. In conjunction with 831C-SW firmware, schedule power to the modem - conserve power when the modem is not needed.

With the graphical interface in G4 LD Utility software, easily configure SoundAdvisor to measure and report only what you need, even when those needs change.

Example of an 831C-SCH schedule with daily Run/Save times (green), two alert recipients on weekdays (orange), three alert levels (red), a special weekend schedule, and the modem “waking up from” low power consumption mode every weekday evening (purple).



Event Definition on the SoundAdvisor

CELLULAR COMMUNICATION

831C-SW

We understand how beneficial it can be to have access to your noise monitor at any time of the day. Due to the remoteness or need to setup contracts and get permits, connecting a noise monitor to a wired network or main power just isn’t feasible.

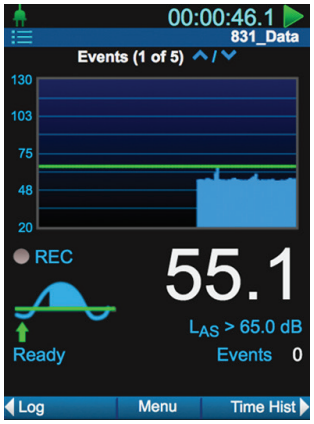
With option 831C-SW you can connect the SoundAdvisor by USB directly to a Sierra Wireless gateway and get a highly portable noise monitor that can easily be powered by battery and/or solar. We recommend the Sierra Wireless model RV50X because of its low power usage and industrial design.

MEASURED SOUND RECORDING

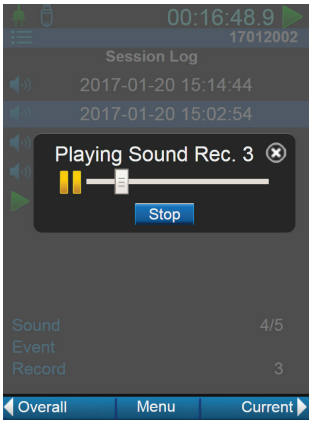
831C-SR

Measuring sound levels is a well-accepted way to objectively quantify the noise radiated by a product in an environmental survey. Rather than rely simply on the objective data, why not record a sample of the sound to truly determine the source of the noise?

The 831C-SR option enables the SoundAdvisor to record audio files in a raw format (.wav) for lossless recording or with .ogg compression to reduce file size. Listen live or to recordings from the meter, or listen to recordings from G4 LD Utility Software or LD Atlas Mobile App. Record audio of automatically triggered events, at the beginning of each Measurement history, manually, or with logic level input.



A recording icon ( ) will turn red on the Model 831C display when recordings are being made.



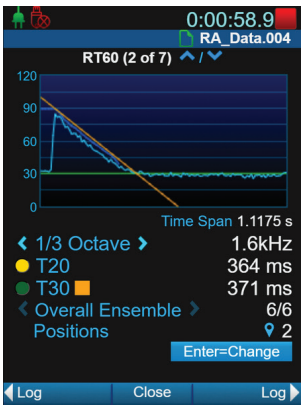
Listen to audio recordings while they are still on the 831C

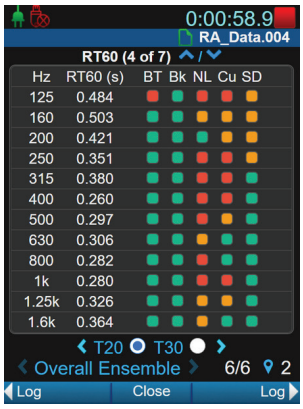
REVERBERATION TIME

831C-RA

Reverberation times are used in architectural acoustics applications ranging from simple experimental reverberation time determination for room performance, to calculating absorption coefficients for material performance. SoundAdvisor with 831C-RA measures decays and then computes reverberation time according to ISO or ASTM standards. When using the Interrupted Noise method, the SoundAdvisor not only triggers the data acquisition, but its built-in Noise Generator can be used to drive the omni-directional sound source. Integrated Impulse method is also available. Measurements can be made using 1/3 octaves or full octave bands. The meter computes the decay times automatically, shows the T20 and T30 spectra superimposed, computes seven (7) quality indicators per frequency, and grades the measurement data.

The resulting data and decays can be exported to the G4 LD Utility or can be processed further in DNA for reverberation time, absorption coefficients, or sound insulation calculations.





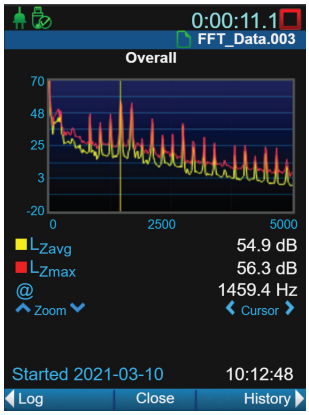
FFT SOUND AND VIBRATION ANALYSIS

831C-FFT

When higher frequency resolution than 1/3 octaves is needed, FFT Frequency Analysis Model 831C-FFT is the ideal solution. The narrow-band filtering provided by Fast Fourier Transform (FFT) Analysis of single-channel acoustic or vibration sources is useful for machinery analysis, product development, source detection, tonality measurement, fault analysis, and vibration troubleshooting. Offering precision spectral analysis of signals, FTT acquisition settings can be adjusted to visualize specific acoustic and vibration phenomena. Using FFT on the handheld SoundAdvisor Sound Level Meter is a convenient way to achieve an objective measurement of tones or vibration phenomena in the field.

Tonality Standards Supported

- ISO/PAS 20065:2016
- ISO 1996-2:2007 Annex C
- ISO 1996-2:2017 (ISO/PAS 20065)



Option 831C-FFT

SOFTWARE SOLUTIONS

The Model 831C has numerous on-board capabilities, yet often further processing, visualization, or reporting needs exist. For this purpose the Model 831C can be used as a portable instrument and retrieve the data, work as a data acquisition front-end, or in combination with other products.

G4 LD UTILITY

The G4 LD Utility program is easy-to-use Windows® software for the Model 831C providing configuration set-up, data download, and remote access.

- Store measurement set-ups for use on one or more Sound Level Meters
- Download data to PC and export to Excel® for further analysis
- Connect to 831C-based meters and noise monitoring systems via USB, Ethernet, or cellular connection
- Manage multiple noise meters and systems with simple and convenient project and file management
- View time history data in graphical format
- Listen to audio recordings
- View Sound Level Meter screen on your PC – ideal for presentations or training

The Software Development Kit is available for advanced uers looking to integrate the SoundAdvisor into an existing application.

DATA NAVIGATION AND ANALYSIS SOFTWARE

SWW-DNA

Data Navigation and Analysis Software (SWW-DNA) is designed to analyze and report environmental noise, worker exposure, and architectural acoustic measurements with an interactive graphical interface. With many sound studies being similar in nature, a drag-and-drop feature places new data in an existing layout that allows for quick, professional-looking reports. DNA can either retrieve existing files from Model 831C, or can drive the 831C as a data acquisition front-end.

- Remote network access
- Interactive graphs with data: zoom, overlay Time History and spectrogram with playable event sound recordings, advanced event analysis, mapping, industrial hygiene, and more.
- Template-based operation with customizable options

SOFTWARE DEVELOPMENT KIT

831C-SDK

Build your own software or integrate the SoundAdvisor into your existing application using our Software Development Kit (SDK).

The Software Development Kit for the Model 831C interfaces smoothly and directly with Microsoft® or Linux® programming environments supporting Excel®, HTML5, Javascript, Visual C++, or C# programming languages. The SDK provides functionality to connect and fully control the Model 831C over USB, network, or wireless gateway (modem) connections. File download is supported and the SDK includes documentation and software for extracting data from files. With JSON (JavaScript Object Notification), the SDK makes it easy to create modern, web-based applications with minimal effort.

MOBILE DEVICE APPLICATION

LD Atlas™ App

LD Atlas™ app is a free mobile app for use with your new Larson Davis equipment. Install LD Atlas on your phone or tablet – available for both iOS® and Android™ – and connect to your SoundAdvisor. Use LD Atlas to set up measurements and see a live view of your meter.

SYSTEMS AT-A-GLANCE

STANDARDS, FEATURES, AND SPECIFICATIONS

STANDARDS MET BY MODEL 831C		
The Model 831C meets the specifications of the following standards:		
Sound Level Meter Standards		
IEC61672-1 Ed. 2.0 (2013) Class 1		
IEC60651 Ed 1.2 (2001) and IEC60804 (2000-10) Type 1		
ANSI S1.4-2014 Class 1		
ANSI S1.43-1997 Type 1		
Octave Filter Standards (Option 831C- OB3)		
IEC61260 Ed. 2.0 (2014) Class 1		
ANSI S1.11-2014 Class 1		
Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use		
2014/35/EU Low Voltage Safety Directive		
IEC 61010-1 Ed. 3.0 (2010-06)		
2011/65/EU RoHS Directive		
Sound Level Meter Specifications		
Averaging (Integration Method)	Linear or Exponential	
Time Weightings	Slow, Fast,or Impulse	
Frequency Weightings	A, C, and Z	
Peak Detector Frequency Weighting	A, C, or Z	
Gain	0 dB or +20 dB	
Sample Rate	51,200 Hz	
Peak Rise Time	30 µs	
Metrics Measured	Leq, Lmax, Lmin, Lpeak, Ln (6 values), LDN, LDEN, LCeq – LAeq	
Physical Characteristics		
Length with Microphone and Preamplifier	11.35 in	29.0 cm
Length, Instrument Body Only	8.8 in	22.4 cm
Width	2.8 in	7.1 cm
Depth	1.6 in	4.1 cm
Weight with Batteries, No Preamplifer or Microphone	17.3 oz	490 g

GENERAL SPECIFICATIONS	
Reference Level	114.0 dB re. 20 µPa
Reference Level Range	Single large range for SLM measurements
Reference Frequency	1000 Hz
Reference Direction	0° is perpendicular to the microphone diaphragm
Operating Temperature	≤ ± 0.5 dB error between -22°F to +122 °F (-30 °C to 50 °C)
Storage Temperature	-40 °F to 176 °F (-40 °C to 80 °C)
Humidity	≤ ± 0.5 dB error from 10% to 99% relative humidity (non-condensing)
Equivalent Microphone Capacitance	12 pF
Effect of an Extension Cable	None up to 200 ft (61 m) with EXCxxx cable
Approvals	CE, ROHS, WEEE
Extended Weather Options	-40 °F to +158 °F (-40 °C to +70 °C) operation with CER-831-E
Resolution Specifications	
Levels	0.1 dB
Elapsed Time	0.1 s
Real Time Clock	1 s
Integration Time	
Time Averaged Levels and Sound Exposure Levels	
Minimum	0.1 s
Maximum with Daily Autostore Enabled	Unlimited
Maximum with Daily Autostore Disabled	> 23 days with error < 0.5 dB

GENERAL SPECIFICATIONS (CONTINUED)	
Ln Statistics	
Number of Selectable Parameters	6 in xx.xx% format
Spectral Statistics	Requires Octave Analysis option (831C-OB3)
Markers	
Number of Markers	10
Prenamed Markers	Truck, Automobile, Motorcycle, Aircraft, Exclude
Back Erase	
Back Erase Time	5 or 10 s
Measurement Control Modes	
Available Modes	Manual Stop, Timed Stop, Stop when Stable, Continuous, Single Block Timer, Daily Block Timer
Timed Stop	Time in hh:mm:ss
Stop When Stable	Delta level in xx.x dB and time in hh:mm:ss
Continuous with Daily Auto-Store	1, 2, 4, 6, 12, 24, 48, 96 or 144 files per day, automated file numbering “yymmddnn.LD0”
Restart after Power Failure	Automatic if powered by 12 VDC and continuous run mode
Single Block Timer	Start date and time to end date and time
Daily Block Timer	Up to 3 blocks between each start and end date
Clock Stability	
< 1 sec in 24 hours, at 75 °F (+24 °C)	
< 10 sec in 30 days, at -40 °F to +158 °F (-40 °C to +70 °C)	
< 1 s when using NTP	
Microphone Input	
Connector	Latching 5-pin connector
Input Impedance	100 kΩ and 300 pF
Full Scale Input (0 dB gain)	14 Vpeak
ICP Current (requires ADP074)	4 mA
AC/DC Output	
Jack	2.5 mm (32 in) female
AC Output Voltage Range	± 14 Vpeak (preamplifier output)
	± 2.1 Vpeak with 0, 20 or 40 dB gain (for LINE inputs)
AC Output Recommended Load	10 kΩ or greater
DC Output Voltage Scale	10 mV per dB, 0 V for 0 dB, 1 V = 100 dB
DC Output Frequency & Time Weighting	Follows SLM Settings: A, C, or Z and S, F, or I
Power Supply	
Batteries	4-AA (LR6) NiMH, 1.5 V Lithium or Alkaline cells (supplied with 2500 mAh NiMH)
External Power (5 V from USB)	USB Mini-B connector to * USB interface from computer * PSA029 AC to DC power adaptor
External Power	I/O connector: 10 to 25 VDC (Use cable CBL140)
Operating Time (with power save options)	> 18 hours (1.5 V Lithium batteries)
	> 8 hours (Alkaline or NiMH batteries)
Power Consumption with PRM831	1.1 W (backlight off, running)
	≤ 2 W (with DVX012)
	5 W (maximum)
Memory Retention	
Data Memory	Non-volatile flash memory, backup performed every minute
Real-time Clock	≥ 1 year with batteries removed

GENERAL SPECIFICATIONS (CONTINUED)				
Broadband Noise Levels				
Self-generated Electrical Noise	**0 dB Gain**		**20 dB Gain**	
Weighting	Typical (dB)	Max (dB)	Typical (dB)	Max (dB)
A	10	12	6	9
C	13	16	12	15
Z	22	25	22	25
Self-generated Total Noise	**0 dB Gain**		**20 dB Gain**	
Weighting	Typical (dB)	Max (dB)	Typical (dB)	Max (dB)
A	16	19	16	17
C	17	20	16	19
Z	23	26	23	26
Note: Combination of the electronic noise and the thermal noise of the 377B02 microphone at 68 °F (20 °C) measured in a sealed and vibration isolated cavity with an averaging time of 60 seconds. Electronic noise of the instrument with an ADP090 (12 pF) in place of the microphone highest anticipated self-generated noise.				

MODEL 831C WITH PRM831 AND 377B02 MICROPHONE			
		0 dB Gain	**20 dB Gain**
Dynamic Range	A	17 dB - 140 dB	16 - 120 dB
	C	17 dB - 140 dB	17 - 120 dB
	Z	24 dB - 140 dB	23 - 120 dB
Measurement Range [1]	A	24 dB - 140 dB	20 - 120 dB
	C	26 dB - 140 dB	25 - 120 dB
	Z	36 dB - 140 dB	33 - 120 dB
Peak Range	A	65 dB - 143 dB	44 - 123 dB
	C	66 dB - 143 dB	45 - 123 dB
	Z	68 dB - 143 dB	59 - 123 dB
Max Level	SPL	140 dB	120 dB
	PEAK	143 dB	123 dB

[1] As defined in IEC 61672-1. Microphone and electrical self-noise included

OPTIONS AT-A-GLANCE

SPECTRAL ANALYSIS	
Octave Analysis (with Option 831C- OB3)	
1/1 Octave Filters	8 Hz to 16 kHz
1/3 Octave Filters	6.3 Hz to 20 kHz
Octave Analysis Parameters	
Filters	None, 1/1 octave, 1/3 octave, or 1/1 and 1/3 octaves
Frequency Weighting	A, C, or Z (independent of broadband weighting)
Maximum Spectrum	Maximum in each band or Spectrum at broadband Lmax
Spectral Statistics	6 percentiles per filter
Octave Band Logging Capability	Time History (see 831C-LOG) Measurement History (see 831C-ELA) Event History (see 831C-ELA)
Normalized Spectrum	
View Modes	SPL, Leq, Lmax, or Lmin; absolute or relative
Predefined Curves	A, C, -A, -C
User-Defined Curves	Four named for 1/1 octave and four for 1/3 octaves bands
FFT Analysis (with option 831C-FFT)	
FFT Lines	400, 800, 1600, 3200, & 6400
Bandwidth (Hz)	100, 200, 500, 1k, 2k, 5k, 10k, & 20k
Window	Hanning, Flat-top, and Rectangular
Overlap	Fixed 33%

SPECTRAL ANALYSIS (CONTINUED)	
Units	dB re 20 uPa, m/s^2, cm/s^2, mm/s^2, g, ft/s^2, in/s^2, custom
Y-axis	Linear or log
Cursor	Max tracking with harmonic cursors
Supported Sensors	Microphone or ICP® accelerometer (with ADP074)
Integration	Frequency domain to velocity and displacement
Acoustic Weighting	A, C, or Z (none)
PROFILING WITH TIME HISTORY LOGGING, MEASUREMENT HISTORY, AND EVENT HISTORY	
Time History Logging (with option 831C-LOG)	
Record Period	Selections from 2.5 ms to 24 hr
Logging Parameters	Any combination of available broadband and spectral AnyData plus non sound metrics
Measurement History Logging (with option 831C-ELA)	
Interval	1 min to 99 hr
Logging Parameters	Same as Overall Measurements Ln Statistics + Spectral Ln (if OB1 or OB3 enabled)
Sound Record Tagging	At start of each interval (required to enable SR)
Logging Period	20 ms to 5 s (independent of TH or MH)
Logging Parameters	Leq, Lmax, Lpeak, Date and Time, Duration, Exposure in dB and Pa2s, and available spectral Leq and maximum. Event Time History is also available with broadband and spectral levels.
Sound Record Tagging	Required to enable SR at 8 ksps or 16 ksps
SEL	Yes (LAE)
Sound Recording (831C-SR)	
Data Format	Mono wave file (.wav) or compressed (.ogg)
Listening Options	On Model 831C using USB headset with Utility program, DNA, or using standard wave file player
Sample Rate	8, 16, 24, ,48, or 51.2 ksps
Storage Requirement	1 MB/min at 8 ksps to 6 MB/min at 48 ksps for .wav file
Sound Recording Modes	Manual, coupled to marker, at measurement interval start, upon event
Pretrigger	Variable depending upon sample rate; up to 60 s
Duration	Max 9999 s
Sound Streaming	Streaming to host
ROOM AND BUILDING ACOUSTICS	
Reverberation Time (with option 831C-RA)	
Methods	Impulse Excitation and Interrupted Noise
Filters	1/1 (63 Hz to 8 kHz) and 1/3 (50 Hz to 10 kHz)
Sample Time	2.5, 5, 10 or 20 ms
Measurements	T20, T30 and ISO 3382-2 quality indicators
WEATHER (METEOROLOGICAL PARAMETERS)	
Combined Meteorological Unit (with sensor SEN031)	
Measured Parameters	Wind speed and direction, temperature, relative humidity, rain, and hail
Sensor Model	SEN031 (requires CBL167 & DVX008A)
Sensor Noise Level	30 dB A-weighted at 2 ft (61 cm)
Ultrasonic Anemometer – Wind Sensor (with sensor SEN032)	
Measured Parameters	Wind speed and direction
Sensor Model	SEN032 (requires CBL167 & DVX008A)
Sensor Noise Level	30 dB A-weighted at 2 ft (61 cm)
COMMUNICATION OPTIONS	
Direct USB to Sierra Wireless (831C-SW)	
Sierra Wireless RV50(X)	4G cellular gateway
Power	3.2 W with power save configuration

ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
Sound Level Meter	
831C-FF	SoundAdvisor Model 831C sound level meter with Class-1 free-field, pre-polarized precision condenser microphone (50 mV/pa), preamplifier (PRM831), accessory kit (831C-ACC)
831C-FF-KIT1	831C-FF with DVX012 and firmware options 831C-LOG, 831C-OB3, 831C-ELA & 831C-SR
831C-FF-KIT2	SoundAdvisor Model 831C-FF with firmware options 831C-LOG & 831C-OB3
831C-RI	SoundAdvisor Model 831C sound level meter with Class-1 random-incidence pre-polarized condenser microphone (50 mV/Pa), preamplifier (PRM831), accessory kit (831C-ACC)
831C-RI-KIT1	SoundAdvisor Model 831C-RI with DVX012 and firmware options 831C-LOG, 831C-OB3, 831C-ELA & 831C-SR
831C-LOWN	SoundAdvisor Model 831C sound level meter with 378A04 low noise, ICP microphone and preamplifier (450 mV/Pa), accessory kit (831C-ACC) and ICP adapter (ADP074)
831C	SoundAdvisor Model 831C sound level meter for environmental and community noise without microphone or preamplifier
Firmware Options	
831C-LOG	Upgrade Model 831C with logging of time histories with periods from 20 ms to 24 hr
831C-OB3	Upgrade Model 831C with Real-time 1/1 & 1/3 octave filter set
831C-ELA	Upgrade Model 831C with event, interval, and daily histories logging
831C-SR	Upgrade Model 831C to record compressed and uncompressed audio
831C-MSR	Upgrade Model 831C to add Measurement History and sound recording
831C-SW	Upgrade Model 831C to add direct USB communication with Sierra Wireless RV50(X) gateway
831C-SCH	Upgrade Model 831C to add scheduling for measurements, communication options, and alert levels
831C-ELX	Upgrade Model 831C to add the exceedance based logging features of 831C-ELA plus the integrated scheduling features of 831C-SCH
831C-FFT	Upgrade Model 831C to add FFT Analysis and tonality assessment
831C-RA	Upgrade Model 831C to add Reverberation Time measurements and analysis
Calibration	
CER-831	ISO 17025 compliant calibration and certification of 831C (SLM, preamplifier with microphone) and 831C-RPT
CER-831-E	Environmental certification Model 831C for [-40,+158] °F ([-40,+70] °C) range. Includes calibration of 831C and PRM831, 831-RPT, environmental test of microphone. Microphone calibration not included.
CER-MIC	Calibration and certification for microphone
CER-PRM2103-E	Environmental Certification Model PRM2103 for [-40,+158] °F ([-40,+70] °C) range; (no microphone certification); environmental test of microphone
831C-RPT	Model 831C Sound Level Meter certification test report. Certificate for SLM, preamplifier, and microphone.

ORDERING INFORMATION (CONTINUED)	
Microphones and Preamplifiers	
377B02	0.5inch free-field, prepolarized condenser microphone, typical sensitivity = 50 mV/Pa, 3.15 Hz to 20 kHz (±2 dB)
377C20	0.5 inch random incidence, prepolarized condenser microphone 50 mV/Pa, 3.15 Hz to 16 kHz (±2 dB)
377C10	0.25 inch pressure, prepolarized condenser microphone typical sensitivity = 1.6 mV/Pa, 4 Hz to 70 kHz (±2 dB)
378A04	ICP® Low noise microphone & preamplifier system, 6.5 dB A-weighted typical noise
ADP043	0.25 inch microphone to 0.5 inch preamplifier adaptor
PRM831	Model 831C Sound Level Meter preamplifier for 0.5 in free-field or random incidence prepolarized microphones
PRM2103-FF	Permanent Outdoor Preamplifier with free-field microphone with Remote Calibration Check, humidity reading and heater, for pre-polarized microphone. Random or 90 degree response can be selected on the Model 831C.
Software	
SWW-DNA	Basic software and dongle (USB) for evaluation and reporting of data downloaded from the Larson Davis instruments, requires an instrument driver
SWW-DNA-831	Instrument driver for instrument control, set-up, live display, data translation, and data download for Model 831C & 831 sound level meter
SWW-DNA-EV	DNA option for Events tracking: PNL and PNLT Event Time History and EPNL Event
SWW-DNA-BA	DNA software Building Acoustics, allows calculation of transmission loss and sound insulation calculations
SWW-DNA-REMOTE	DNA software for monitoring a remote location when using 820, 824, 870, or 831C Models. Uses modem connection for communication and data download.
Calibrators	
CAL200	Class 1 acoustic calibrator with user selectable output of 94 or 114 dB at 1 kHz. ½ inch opening (no adaptor)
CAL250	Class 1 microphone calibrator, output 114 dB at 251.2 Hz. 1 inch opening with ½ inch (ADP019) adaptor. ⅜ inch (ADP020) and ¼ inch (ADP021) adaptors available

ORDERING INFORMATION (CONTINUED)	
Noise Monitoring System Components	
COM-RV50X	Sierra Wireless Model RV50X cellular gateway to add Internet connectivity through cellular network to 831C. Choose suffix NA/EMEA for North America, Europe, Middle East & Africa. Choose suffix APAC for rest of world. Requires option (831C-SW for direct USB connection).
EPS030-831	Case for Model 831C Sound Level Meter including (1) 21 Ah battery, charger (PSA032), internal preamplifier cable (CBL141), and power distribution cable (CBL151)
EPS036-831	Case on wheels (CCS035) to enclose Model 831C with (2)x 21 Ah batteries (BAT011). Includes CBL166 & CBL168 to power Model 831C
EPS037-831	Case on wheels (CCS035) to enclose Model 831C with 100 Ah batteries (BAT012). Includes CBL166 & CBL168 to power Model 831C
EPS044	Noise monitor enclosure for 831C including CCS051, CCS052, ACC009, PSA038, CBL224-02, CBL225-01, CBL226-02 & CBL228-03
EPS044-SLA	Noise monitor enclosure for 831C including CCS051, CCS052, BAT020 35 Ah SLA battery, ACC009, PSA038, CBL224-02, CBL225-01, CBL226-02 & CBL228-03
EPS044-LFP	Noise monitor enclosure for 831C including CCS051, CCS052, BAT019 45 Ah LiFePo battery, ACC009, PSA038, CBL224-02, CBL225-01, CBL226-02 & CBL228-03. License required to ship battery
EPS2116	Environmental protection for ½ inch preamplifiers with windscreen, bird spikes, desiccants, and universal mounting
SEN031	Combined weather sensor: wind speed and direction (no moving parts), temperature, humidity, pressure, rainfall (requires CBL167 cable + DVX008A)
TRP001	Instrumentation tripod with ADP032 preamplifier to tripod interface
TRP003	Support tripod, maximum height 8 ft (2.4 m) used in portable NMS systems
CBL174	Waterproof cable connecting EPS030-831 to external PC, 2 m USB A-to-B
ACC009	Monopole for use in EPS044 and NMS044 systems
BAT019 [2]	45 Ah 12V LiFePo battery. Weighs 12.8 pounds (5.8 kg)
BAT020	35 Ah 12V SLA battery. Weighs 24.7 pounds (11.2 kg)
CBL218	Cable, USB-A to micro-B, 3 ft (1 m)
CBL222-08	Cable connecting 831C or 831 to PRM2103 with Anderson Powerpole® connectors for 12V power. (8 ft / 2.4 m)
CBL222-20	Cable connecting 831C or 831 to PRM2103 with Anderson Powerpole® connectors for 12V power. (20 ft / 6 m)
CBL223-02	Power cable for Sierra Wireless with sense line and Anderson Powerpole® connectors for 12V power (2 ft / 0.6 m)
CBL224-02	Power cable for 831C or 831 with Anderson Powerpole® connectors for 12V power (2 ft / 0.6 m)
CBL225-01	Power cable for battery with spade connectors and Anderson Powerpole® connectors for 12V power (1 ft / 0.3 m)
CBL226-02	Power cable with Anderson Powerpole® connectors to bare wires (2 ft / 0.6 m)
CBL228-03	Cable, 1m, with MC-4 connectors for solar and bare wires for use with solar charge controllers
CCS051	Base enclosure for EPS044 and NMS044 systems that includes mounting plate, glands and mount for ACC009
CCS052	Canvas bag with zipper and handles. 19 x 9 x 6 in (48 x 23 x 15 cm)

ORDERING INFORMATION (CONTINUED)	
Noise Monitoring System Components (Continued)	
COM-ANT-GPS	GPS antenna with SMA connector and cable for use Sierra Wireless modem like RV50X
SLP001	Portable folding 60 Watt solar panel with integrated stand and carrying case
SLP002	Portable folding 100 Watt solar panel with integrated stand and carrying case
PSA038	Solar charge controller, 10 A, used in EPS044 and NMS044 configurations with SLA batteries
PSA039	AC power supply, 15 V, 90 W, with MC4 connectors for use with EPS044 & NMS044
PSA040	Battery Charger for SLA batteries with Anderson Powerpole connectors. Input: 100–240 VAC, 50–60 Hz, 0.80–035 A. Output: 14.7 VDC, 3 A, Output cable length 1 ft (30 cm)
PSA043	Battery Charger for LiFePo batteries with Anderson Powerpole connectors. Input: 100–240 VAC, 50–60 Hz. Output: 3 A, cable length 1 ft (30 cm)
PSA044	Solar charge controller, 10 A, used in EPS044 and NMS044 configurations with LiFePo batteries
Permanent Noise Monitoring Systems	
NMS044-LFP60-E [2]	Complete NMS for use outside US including Model 831C with 831C-LOG, 831C-ELA, 831C-SW, EPS044-LFP, COM-RV50X-APAC, 2 ea. COM-ANT-HG, PRM²103-FF, EPS²116, SLP001, PSA039 & necessary cables. For use when solar insolation > 2 kW•h/m2/day
NMS044-LFP60-U [2]	Complete NMS for use in US including Model 831C with 831C-LOG, 831C-ELA, 831C-SW, EPS044-LFP, COM-RV50X-NA/EMEA, 2 ea. COM-ANT-HG, PRM2103-FF, EPS2116, SLP001, PSA039 & necessary cables. For use when solar insolation > 2 kW•h/m2/day
NMS044-LFP100-E [2]	Complete NMS for use outside US including Model 831C with 831C-LOG, 831C-ELA, 831C-SW, EPS044-LFP, COM-RV50X-APAC, 2 ea. COM-ANT-HG, PRM2103-FF, EPS2116, SLP002, PSA039 & necessary cables. For use when solar insolation > 1 kW•h/m2/day
NMS044-LFP100-U [2]	Complete NMS for use in US including Model 831C with 831C-LOG, 831C-ELA, 831C-SW, EPS044-LFP, COM-RV50X-NA/EMEA, 2 ea. COM-ANT-HG, PRM2103-FF, EPS2116, SLP002, PSA039 & necessary cables. For use when solar insolation > 1 kW•h/m2/day
NMS044-SLA60-E	Complete NMS for use outside US including Model 831C with 831C-LOG, 831C-ELA, 831C-SW, EPS044-SLA, COM-RV50X-APAC, 2 ea. COM-ANT-HG, PRM2103-FF, EPS2116, SLP001, PSA039 & necessary cables. For use when solar insolation > 2 kW•h/m2/day
NMS044-SLA60-U	Complete NMS for use in US including Model 831C with 831C-LOG, 831C-ELA, 831C-SW, EPS044-SLA, COM-RV50X-NA/EMEA, 2 ea. COM-ANT-HG, PRM2103-FF, EPS2116, SLP001, PSA039 & necessary cables. For use when solar insolation > 2 kW•h/m2/day
NMS044-SLA100-E	Complete NMS for use outside US including Model 831C with 831C-LOG, 831C-ELA, 831C-SW, EPS044-SLA, COM-RV50X-APAC, 2 ea. COM-ANT-HG, PRM2103-FF, EPS2116, SLP002, PSA039 & necessary cables. For use when solar insolation > 1 kW•h/m2/day
NMS044-LFP100-U	Complete NMS for use in US including Model 831C with 831C-LOG, 831C-ELA, 831C-SW, EPS044-LFP, COM-RV50X-NA/EMEA, 2 ea. COM-ANT-HG, PRM2103-FF, EPS2116, SLP002, PSA039 & necessary cables. For use when solar insolation > 1 kW•h/m2/day

[2] Hazardous materials shipping license required to ship LiFePo battery by common carrier. Battery not allowed on passenger aircraft

LARSON DAVIS
A PCB DIVISION

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MD-0324 revG [0522]

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Nicole Milligan

On August 24, 2020
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

Professional Training:

Fathom Resources, LLC, Middletown, RI
Protected Species Observer Training (August 2020)
• Trained in the PSO position and duties of a PSO
• Trained in the governing regulations to include MMPA and ESA
• Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
• Trained in data recording to include required data fields and submission timelines
• Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
• Trained in safety and professional conduct
• Successfully completed testing meeting the 85% or greater requirement.

Fathom Resources, LLC, Middletown, RI
Northeast Groundfish Dockside Monitor Training (July 2020)
• Trained in the Dockside Monitor position and duties
• Trained in visual observing techniques
• Trained in Northeast Groundfish Species Identification
• Trained in data recording to include required data fields and submission timelines
• Trained in what to expect, normal work environments, communication methods, etc.
• Trained in safety and professional conduct
• Successfully completed testing meeting the 85% or greater requirement.

Education:

2019 - Bachelors of Science Degree - Major: Marine Biology
University of Oregon- Eugene, OR

Professional/Research Experience:

Marine Mammal Observer (August 2020 – Present)
Fathom Resources, LLC, New Bedford, MA
• Deploying on various transit vessels for marine dredging projects in the Northeast as sole marine mammal observer
• Understanding of Northeast high risk marine mammal species interactions dependent on time of year and location
• Extensive understanding of the Marine Mammal Protection Act and Endangered Species Act
• Completion of a daily log describing any marine mammal sightings or interactions and marine construction activities
• Communicating with vessel captains to delay vessel operations in the presence of marine mammals

Inshore Protected Species Observer (January 2021)
Fathom Resources, LLC, Narragansett Bay, RI

- Worked daily aboard survey vessel on marine construction blasting project
- Delayed marine construction operations to avoid harassment of grey seals
- Part of a team PSOs and certified PAM operators to see project to completion

Northeast Fisheries Observer (July 2020 to Present)
Fathom Resources, LLC, East Falmouth, MA

- Deploying solely on-board commercial fishing vessels with captain and crew for 1-10 days at a time, completing over 70 sea days
- Sample all catch and bycatch on a haul-by-haul basis for biological data including lengths, weights, shell heights, species ID, otoliths, scales, etc.
- Identify, document and sample marine mammals and sea bird interactions
- Taking various measurements of fishing gear used on each trip

One Ocean Diving and Research- Oahu, Hawaii
September 2019- January 2020: Research Intern
Principal Investigators/Founders: Ocean Ramsey and Juan Oliphant

- Crewmember aboard the cage-less shark diving vessels
  - Briefed biological factors relating to sharks, shark anatomy, behavior and local species descriptions
  - Aided crew in launching and docking boat for each charter
  - Assisted in sizing and distributing masks, snorkels and fins to each customer
- Completed post dive data set and performed data entry on key aspects of dive used for correlating environmental factors and the displayed shark behavior
- Created research summaries on primary sourced scientific papers; summaries posted on social media for public outreach

Oregon Institute of Marine Biology

June-August 2019- Research Project- Investigation of the Causes of Biofluorescence Displays in Oregon Coast Flatfish Species

- Fish Care
  - Cared for several flatfish species throughout the entire project including scheduled feedings
  - Followed prescribed handling techniques while transferring species
  - Measured fish accurately and efficiently, returning them to their tanks with minimal stress
  - Used prescribed fishing techniques to collect specific fish species, sorted each fish caught during seining process and returned non-targeted fish back into the field
- Laboratory Duties
  - Organized a team to assist in the collection of fish for the project
  - Measured the amount of biofluorescent displays in relation to the total length of each fish
  - Recorded data and created graphs to show the relationship
  - Conducted a complete research project on a new concept found recently in fish species and came up with interesting results to add to the scientific community

Oregon Institute of Marine Biology

September 2018 – August 2019: Research Intern, Deep Sea Biology Lab
Principal Investigator - Dr. Craig Young

- Responsible for Live Animal Care
  - Monitored urchin species on their health status, and reported if any changes occurred
  - Prepared and fed each urchin biweekly
- Performed histology techniques
  - Conducted laboratory testing using appropriate tools and resources
  - Conducted unique staining procedures using latest technology
  - Assessed adequacy of chemicals and stains
  - Conducted laboratory procedures handling specimens and processing testing analyzing examining and reporting on results
- Scanning electron microscopy techniques
  - Prepared and examined sessile animals for identification using scanning electron microscopy

University of Oregon

January 2019- March 2019: Biological Undergrad Learning Assistant: Animal Behavior
Department of Biology Professor - Debbie Schlenoff

- Served as professional assistant to the professor
- Supervised student examinations/reports and graded reading quiz submissions
- Resolved problems encountered by students
- Attended weekly meetings to discuss laboratory activities, examinations, how to improve the course work for students and how to prepare them for exams

Charleston Marine Life Center

April 2018- August 2019: Volunteer Aquarist

- Aquarium Care
  - Participated in animal care and welfare of several subtidal/intertidal Pacific Northwest species
  - Contributed to the training of skates, sol, and starry flounder species
  - Monitored animals' recovering from illness and documented changes
  - Collected organisms from open ocean for aquarium feedings such as Red rock crabs, several seaweed species and muscles
  - Cared for various animals; Trained animals for feedings
  - Monitored all of the organisms' health and tank conditions
  - Memorized many invertebrate and fish species for caring and educational purposes
- Husbandry
  - Prepared specific diets for various marine life species

- Prepared food for animals; carried out feedings; cleaned habitats; ensured the health and well-being of animals
- Preformed live crab feedings for the Giant Pacific Octopus tank and Wolf Eel tank

Research Cruises:

RV Oceanus

September 2019- Researcher
Principal Investigator - Dr. Craig Young

- Worked aboard a research vessel with several grad students
  - Assisted crew in deploying and recovering large Agassiz trawl used on the Oregon Coast to retrieve deep sea invertebrates
  - Collected species up to depths of 1000 meters
  - Keyed out and identified over 150 invertebrate species collected aboard vessel
  - Deployed and recovered CTD for data on water conditions
  - Collected several factors of each deployment/recovery of dredge onto a data sheet
  - Narrated dredge deployments by documenting what was collected and what occurred doing the entire deployment/recovery

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Colleen Rodenbush

On April 1, 2021
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

EDUCATION

University of Massachusetts Dartmouth, North Dartmouth, MA December 2020

College of Arts & Sciences
Bachelor of Science in Biology, Concentration in Marine Biology
Minor in Sustainability
Cumulative GPA: 3.275

Academic Awards/Achievements:

- Dean's List: Spring '20, Fall & Spring '19
- Transfer Merit Scholarship: Spring '18

VOLUNTEER EXPERIENCE

National Marine Life Center, Bourne, MA

Animal Care Team January 2020 – May 2020

- Assisted with the overall care of marine animal patients, including cleaning enclosures, preparing feeds, and maintaining life support system.
- Assisted in routine husbandry procedures including restraint for veterinary exams, tube feedings, and wound care.

Squam Lakes Association, Holderness, NH

Squam Watershed Quality Monitoring September 2016 – March 2017

- Water quality and data analysis for dissolved oxygen, pH, and temperature at various depths.

Climate Reality Project, Plymouth, NH

Volunteer Petitioner September 2016 – March 2017

- Petitioning for 100% renewable energy at Plymouth State University by the year 2030.

INTERNSHIP EXPERIENCE

New England Coastal Wildlife Alliance, Middleboro, MA

Marine Wildlife Intern February 2016 – August 2016

- Assisted with and led educational outreach programs at the local elementary school.
- Shadowed a naturalist on the Capt. Bill & Sons Whale Watching boat.

CERTIFICATIONS

CPR / AED / First-Aid

(Adult / Child / Infant / Choking)
AED / Injury & Universal Precautions
National CPR Foundation

PROFESSIONAL EXPERIENCE

Protected Species Observer Training April 2021
Fathom Resources, LLC, Middletown, RI
• Trained in the PSO position and duties of a PSO
• Trained in the governing regulations to include MMPA and ESA
• Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
• Trained in data recording to include required data fields and submission timelines
• Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
• Trained in safety and professional conduct
• Successfully completed testing meeting the 85% or greater requirement.

Northeast Fisheries Observer Program Training March 2021
NMFS/NOAA Falmouth, MA
• Coursework at the five-week training included practical field identification of fish, marine mammal, sea bird, and turtle species of the U.S. Atlantic Ocean, including species commonly found in the Gulf of Mexico and Gulf of Maine
• Trained in biological sampling of marine mammals, seabirds, and Atlantic sturgeon, and sea turtle sampling and resuscitation techniques (ESO approved training course)
• Trained to document various marine behaviors, such as milling, traveling, and feeding
• Trained to provide detailed information for certain species, such as right whales and humpbacks, to assist in the identification of individuals. Observer documentation includes photographs, video, detailed drawings, body condition, behavior, etc.
• Other training included offshore survival and safety and first aid/CPR
• Successfully completed testing meeting the 85% or greater requirement.
- Have completed work in this program since March 2021 to present

Fisheries Dockside Monitor Training March 2021
Fathom Resources, LLC, Middletown,
• Trained in the Dockside Monitor position and duties
• Trained in visual observing techniques
• Trained in Northeast Groundfish Species Identification
• Trained in data recording to include required data fields and submission timelines
• Trained in what to expect, normal work environments, communication methods, etc.
• Trained in safety and professional conduct
- Successfully completed testing meeting the 85% or greater requirement.
- Have completed work in this program since March 2021 to present

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Nicholas Holtmeier

On April 1, 2021
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

Education

University of Wisconsin Whitewater, Whitewater, WI Graduated December 2020

Deakin University, Warrnambool, VIC, Australia March 2020 - November 2020

Study Abroad Experience

Major

- Biology with an emphasis in Marine Biology and Freshwater Ecology

Courses Completed

Aquatic Biology ◊ Biostatistics ◊ General Ecology ◊ Integrating Marine, Coastal and Catchment Management ◊ Intro to Cell Biology ◊ Marine Botany ◊ Marine Invertebrates ◊ Organic Chemistry ◊ Organic Evolution ◊ Water Resources ◊ Writing in Biology ◊ Aquaculture and the Environment ◊ Marine and Coastal Ecosystems ◊ Marine Pollution ◊ Marine Vertebrates

Professional Experience

Protected Species Observer Training April 2021
Fathom Resources, LLC, Middletown, RI
• Trained in the PSO position and duties of a PSO
• Trained in the governing regulations to include MMPA and ESA
• Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
• Trained in data recording to include required data fields and submission timelines
• Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
• Trained in safety and professional conduct
• Successfully completed testing meeting the 85% or greater requirement.

Northeast Fisheries Observer Program Training March 2021
NMFS/NOAA Falmouth, MA
• Coursework at the five-week training included practical field identification of fish, marine mammal, sea bird, and turtle species of the U.S. Atlantic Ocean, including species commonly found in the Gulf of Mexico and Gulf of Maine
• Trained in biological sampling of marine mammals, seabirds, and Atlantic sturgeon, and sea turtle sampling and resuscitation techniques (ESO approved training course)
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• Other training included offshore survival and safety and first aid/CPR
• Successfully completed testing meeting the 85% or greater requirement.
• Have completed work in this program since March 2021 to present

Fisheries Dockside Monitor Training March 2021
Fathom Resources, LLC, Middletown,
• Trained in the Dockside Monitor position and duties
• Trained in visual observing techniques
• Trained in Northeast Groundfish Species Identification
• Trained in data recording to include required data fields and submission timelines
• Trained in what to expect, normal work environments, communication methods, etc.
• Trained in safety and professional conduct
• Successfully completed testing meeting the 85% or greater requirement.
• Have completed work in this program since March 2021 to present

Sea Grant Watercraft Inspector May 2018 -Jan 2021
University of Wisconsin - Extension, Madison, WI
- Inform public about aquatic and terrestrial invasive species
- Perform inspections of boating, hunting, and fishing equipment
- Accurately record survey data in statewide database

Jonathan Moragan
Fathom Resources

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Jonathan Morgan

On June 4, 2020
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

Jonathan D. Morgan

Education:

University of Massachusetts, Amherst: 2019
Bachelor of Science in Biology

Global Learning Charter Public High School
2014 Valedictorian

Advanced Scuba Certification Naui Certification through
Project DEEP at UMASS Amherst

- 140+ recorded dives on the east coast

Professional Training:

National Marine Fisheries Service, Northeast Fisheries Observer Program (NEFOP)
East Falmouth, MA
At-Sea Monitor Groundfish Observer trained (Feb 2020)

- Coursework at the two-week training included practical field identification of fish, marine mammal, sea bird, and turtle species of the U.S. Atlantic Ocean, including species commonly found in the Gulf of Mexico and Gulf of Maine
- Trained in biological sampling of marine mammals, seabirds, and Atlantic sturgeon, and sea turtle sampling and resuscitation techniques (ESO approved training course)
- Trained to document various marine behaviors, such as milling, traveling, and feeding
- Trained to provide detailed information for certain species, such as right whales and humpbacks, to assist in the identification of individuals. Observer documentation includes photographs, video, detailed drawings, body condition, behavior, etc.
- Other training included offshore survival and safety and first aid/CPR
- Successfully completed testing meeting the 85% or greater requirement.

Fathom Resources, LLC, Middletown, RI
Protected Species Observer Training (June 2020)

- Trained in the PSO position and duties of a PSO
- Trained in the governing regulations to include MMPA and ESA
- Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
- Trained in data recording to include required data fields and submission timelines
- Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
- Trained in safety and professional conduct
- Successfully completed testing meeting the 85% or greater requirement.

Relevant Work Experience:

Marine Mammal Observer, Fathom Resources (June 2020 – Present)

• Deploying on various marine construction projects in the Northeast as sole marine mammal observer or part of a team.
• Understanding of Northeast high risk marine mammal species interactions dependent on time of year and location
• Extensive understanding of the Marine Mammal Protection Act and Endangered Species Act
• Completion of a daily log describing any marine mammal sightings or interactions and marine construction activities
• Communicating with vessel captains to delay vessel operations in the presence of marine mammals

Fisheries Observer, Fathom Resources February 2020-Present

- Biological sampling (weight, length, sightings records etc.) of fish, marine mammals, turtles, and birds for NMFS
- Extensive knowledge of both common and endangered marine species of New England
- Knowledge of environmental policies (Endangered Species Act, Marine Mammal Protection Act, etc.)
- Photographing marine species for data and sighting verification purposes
- Experience working and living at sea for up to 14 days at a time
- Conflict resolution skills
- Determines catch composition and catch estimation onboard commercial fishing vessels and submits detailed data to the NMFS
- Skilled in identification and sampling (length, weight, extracting biological samples, etc.) of northeast and Mid-Atlantic coast fish species, including alewife, blueback herring, menhaden, winter flounder, and striped bass
- Skilled in identification and sampling of marine mammals, sea birds, and sea turtles, which includes detailed documentation of these species

Northeast Groundfish Dockside Monitor, Fathom Resources 2020 – Present

- Biological data recording of northeast groundfish commercial fisheries offloads
- Skilled in identification of northeast groundfish species

Scientific Diver, Fathom Resources 2019- Present

- Collected and identified species of freshwater shellfish and reported on fish, plants, and amphibians as well as topographical features of sites
- Worked on boats and assisted with their operation
- Spent months away from home at a time on work projects

Kevin Anderson
Fathom Resources

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Kevin Anderson

On June 4, 2020
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

Kevin Anderson

Education

BS, Marine Biology University Of Rhode Island Cumulative GPA: 3.84/4.0 — 2015-2017, Kingston, RI

AAS, Environmental Science Hudson Valley Community College — 2013-2015, Troy, NY

Professional Training

National Marine Fisheries Service, Northeast Fisheries Observer Program (NEFOP)
East Falmouth, MA
At-Sea Monitor Groundfish Observer trained (Feb 2020)

- Coursework at the two-week training included practical field identification of fish, marine mammal, sea bird, and turtle species of the U.S. Atlantic Ocean, including species commonly found in the Gulf of Mexico and Gulf of Maine
- Trained in biological sampling of marine mammals, seabirds, and Atlantic sturgeon, and sea turtle sampling and resuscitation techniques (ESO approved training course)
- Trained to document various marine behaviors, such as milling, traveling, and feeding
- Trained to provide detailed information for certain species, such as right whales and humpbacks, to assist in the identification of individuals. Observer documentation includes photographs, video, detailed drawings, body condition, behavior, etc.
- Other training included offshore survival and safety and first aid/CPR
- Successfully completed testing meeting the 85% or greater requirement.

Fathom Resources, LLC, Middletown, RI
Protected Species Observer Training (June 2020)

- Trained in the PSO position and duties of a PSO
- Trained in the governing regulations to include MMPA and ESA
- Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
- Trained in data recording to include required data fields and submission timelines
- Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
- Trained in safety and professional conduct
- Successfully completed testing meeting the 85% or greater requirement.

Related Work Experience

Marine Mammal Observer (June 2020 – Present)
Fathom Resources, LLC,

- Deploying on various marine construction projects in the Northeast as sole marine mammal observer or part of a team.
- Understanding of Northeast high risk marine mammal species interactions dependent on time of year and location
- Extensive understanding of the Marine Mammal Protection Act and Endangered Species Act
- Completion of a daily log describing any marine mammal sightings or interactions and marine construction activities
- Communicating with vessel captains to delay vessel operations in the presence of marine mammals

Fisheries Observer, Fathom Resources February 2020-Present

- Biological sampling (weight, length, sightings records etc.) of fish, marine mammals, turtles, and birds for NMFS
- Extensive knowledge of both common and endangered marine species of New England
- Knowledge of environmental policies (Endangered Species Act, Marine Mammal Protection Act, etc.)
- Photographing marine species for data and sighting verification purposes
- Experience working and living at sea for up to 14 days at a time
- Conflict resolution skills

- Determines catch composition and catch estimation onboard commercial fishing vessels and submits detailed data to the NMFS
- Skilled in identification and sampling (length, weight, extracting biological samples, etc.) of northeast and Mid-Atlantic coast fish species, including alewife, blueback herring, menhaden, winter flounder, and striped bass
- Skilled in identification and sampling of marine mammals, sea birds, and sea turtles, which includes detailed documentation of these species

Fisheries Ecology Intern
Dauphin Island Sea Lab, Dauphin Island, AL March 2018-November 2018

- Assisted in examining populations of popular reef fish, Red Snapper (*Lutjanus campechanus*), Grey Triggerfish (*Balistes capriscus*), and Greater Amberjack (*Seriola dumerili*) through a fisheries independent survey using vertical longline, ROV surveys, and trawls.
- Set and retrieved gillnet to sample inshore fish species of Mobile Bay.
- Extracted otoliths and gonads for age and gonadosomatic index measurements of caught reef fish.
- Completed second cuts and polishing on otoliths to be aged.
- Aided with ROV (remote operated vehicle) deployment and retrieval prior to fishing.
- Performed post processing of ROV videos through taking standardized fish measurements using Image J.
- Examined archived videos of boat ramps during Red Snapper season to estimate recreational fishing effort and took lead in compiling spreadsheet data using Microsoft Excel.
- Analyzed video footage on deployed vertical longlines to investigate depredation of caught fish due to sharks or dolphins.
- Tagged Red Snapper with high dollar tags and released to determine angler fishing effort, and tag shedding rate.
- Provided topwater support for scientific divers deploying and retrieving acoustic fish tag receivers.
- Participated on 10 day multiphase echosounder (side scan sonar and bathymetry) cruise to map bottom surface within the Alabama Offshore General Reef Permit Zone.
- Performed patch tests to calibrate echosounder system on different bottom strata.

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Monique Arsenault

On November 10, 2019
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

Monique Arsenault

Education

University of New Hampshire, Durham NH (2012-2016)
Bachelor of Science, Medical & Veterinary Science

Experience

Marine Mammal Observer (November 2019 – Present)
Fathom Resources, LLC, New Bedford, MA

- Deploying on various transit vessels for marine dredging projects in the Northeast as sole marine mammal observer
- Understanding of Northeast high risk marine mammal species interactions dependent on time of year and location
- Extensive understanding of the Marine Mammal Protection Act and Endangered Species Act
- Completion of a daily log describing any marine mammal sightings or interactions and marine construction activities
- Communicating with vessel captains to delay vessel operations in the presence of marine mammals

Lead Protected Species Observer (January 2021)
Fathom Resources, LLC, Narragansett Bay, RI

- Worked daily aboard a barge on marine construction blasting project as main point of contact for all marine mammal interactions
- Delayed marine construction operations to avoid harassment of grey seals
- Formed a team of PSOs and certified PAM operators to see project to completion
- Provided gear and PSO training to Fathom Resources employees
- Organized daily operation start and end times dependent on marine construction work and in compliance with project-specific protocols
- Maintained communication between project PSOs, PAM operators, and marine construction workers

Northeast Fisheries Observer (November 2018 – March 2020)
Fathom Resources, LLC, East Falmouth, MA

- Deploying solely on-board commercial fishing vessels with captain and crew for 1-10 days at a time, completing over 70 sea days
- Sample all catch and bycatch on a haul-by-haul basis for biological data including lengths, weights, shell heights, species ID, otoliths, scales, etc.
- Identify, document and sample marine mammals and sea bird interactions
- Taking various measurements of fishing gear used on each trip

Assistant Coordinator, Fisheries Observer Programs – ASM and IFS (May 2020 – Present)
Fathom Resources, LLC, Middletown, RI

- Work with fishing industry deploying observers onboard commercial fishing vessels during COVID-19 pandemic
- Assist in training and certification of Dockside Monitors and Marine Mammal Observers on species identification and project-specific protocols

- Extensive use of Microsoft Word, Excel, PowerPoint, Adobe, and Outlook
- Assist in offshore marine safety training for new observers going through initial observer training
- Provide observer support in trip set up, communication with vessel captains, port directions, issuing gear, and specific trip needs

Groundfish Dockside Monitor (May 2020 – Present)
Fathom Resources, LLC, New Bedford, MA

- Cover full offloads at Blue Harvest Fisheries in New Bedford, MA
- Record weights of all offloaded catch from commercial fishing vessels, ranging from 10,000 to 180,000lbs of total catch in a single offload
- Maintain communication with fish house employees to ensure all catch is accounted for
- Create and edit comprehensive datasheets for each offload for reviewal by sector manager

Environmental Technician I (August 2016 – August 2018)
Normandeau Associates, Bedford, NH

- Independently sorting, identifying, and bio-massing North Atlantic seaweed by species
- Participated in an annual field survey of soft-shell clams in Hampton, NH
- Trained and supervised staff on benthic invertebrate projects
- Taxonomy of fish larvae and eggs from the Hudson River
- Sort and identify ichthyoplankton, benthic invertebrate and bivalve larvae samples in a quality-controlled work environment
- Organized in-house and long-term sample storage

Professional Training & Certifications

- Protected Species Observer (PSO) Certification – NMFS Approved
- Northeast Protected Species, Marine Mammal, Sea Turtle, Atlantic Sturgeon & Sea Bird identification and sampling protocols training – NOAA
- Northeast Dockside Monitor Certification – Fathom Resources
- Marine Offshore Safety Certification – NOAA
- Northeast At-Sea Monitor Certification – NOAA
- Industry Funded Scallop Observer – NOAA
- Industry Funded High Volume Fishery Certification – NOAA
- Industry Funded Monitor – Portside Observer – NOAA
- Red Cross Adult and Infant CPR/AED and First Aid Certification (2018)

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Stewart Michie

On October 29, 2022
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

STEWART MICHIE

PROFESSIONAL TRAINING

Fathom Resources, LLC, Middletown, RI
Protected Species Observer Training (October 2022)

- Trained in the PSO position and duties of a PSO
- Trained in the governing regulations to include MMPA and ESA
- Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
- Trained in data recording to include required data fields and submission timelines
- Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
- Trained in safety and professional conduct
- Successfully completed testing meeting the 85% or greater requirement.

National Marine Fisheries Service, Northeast Fisheries Observer Program (NEFOP)
East Falmouth, MA
At-Sea Monitor Groundfish Observer (October 2021)

- Coursework at the two-week training included practical field identification of fish, marine mammal, sea bird, and turtle species of the U.S. Atlantic Ocean, including species commonly found in the Gulf of Mexico and Gulf of Maine
- Trained in biological sampling of marine mammals, seabirds, and Atlantic sturgeon, and sea turtle sampling and resuscitation techniques (ESO approved training course)
- Trained to document various marine behaviors, such as milling, traveling, and feeding
- Trained to provide detailed information for certain species, such as right whales and humpbacks, to assist in the identification of individuals. Observer documentation includes photographs, video, detailed drawings, body condition, behavior, etc.
- Other training included offshore survival and safety and first aid/CPR
- Successfully completed testing meeting the 85% or greater requirement.

WORK EXPERIENCE

NMFS FISHERIES OBSERVER
Fathom Resources; October 2021 to Present
Complete at-sea deployment on US commercial fishing vessels targeting Northeast Groundfish species. Collect biological catch level data on gear types to include trawl, gillnet, handline and longline.

WESTERN MARINE SERVICES
Underwater Hull Maintenance; August 01, 2020- April 14, 2021
Worked underwater cleaning and maintaining boat hulls. This involved scrapping barnacles off of boats, scrubbing algae, replacing anode plates, and replacing and sanding propellers.

EXPLORER MARINE SERVICES

Underwater Hull Maintenance; December 1, 2018- April 3, 2020
Same duties as above.

HOSTEL REEF TRIPS, CAIRNS, AUSTRALIA
Dive Master, August 24, 2015 – January 24, 2016
Tasks included leading dive tours on the Great Barrier Reef, mooring and unmooring ropes, driving boats, gearing up divers, rescuing panicked divers, and general deckhand work.

MICHIE LAW FIRM, OXNARD, CA
Assistant/Secretary, October 5, 2013 – January 20, 2015
Aided a Real Estate lawyer, managing his paper and hard drive files, answering phone calls and inquiries, greeting walk-ins, and communicating with his current clients.

EDUCATION

University of California, San Diego (UCSD)
Graduated Winter, 2021
B.S. in Marine Biology

ADDITIONAL SKILLS

*Bilingual- I speak fluent Spanish.
*Experience in biological and chemical lab settings including handling harmful bacteria samples.
*Experience using excel and data entry, including using a dichotomous key.
*Experience on a scientific vessel using trawling for species collection.
*Experience using R and RStudio.
*Ample experience working on boats and out at sea for long periods of time.
*Volunteer Aid of a Nature Reserve for 6 months- Primarily maintained the ecosystem (invasive species) and helped assemble weather stations.
*Certified Divemaster (including training as a rescue diver).

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Ethan Jordan

On October 29, 2022
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

Ethan Jordan

· Marine biologist with experience conducting independent and group research in
· Experience includes conducting species mapping, shipwreck mapping, studying reef substrate diversity, conducted trawl and seine surveys, completing water sampling, and conducting scientific lab work
· 9+ years of scuba diving experience, certified as a Master Diver
· Work history includes a wide variety of roles in lab and field environments in marine biology research, invasive species control, and environmental restoration

Willing to relocate: Anywhere

Professional Training

Fathom Resources, LLC, Middletown, RI
Protected Species Observer Training (October 2022)

- Trained in the PSO position and duties of a PSO
- Trained in the governing regulations to include MMPA and ESA
- Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
- Trained in data recording to include required data fields and submission timelines
- Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
- Trained in safety and professional conduct
- Successfully completed testing meeting the 85% or greater requirement.

National Marine Fisheries Service, Northeast Fisheries Observer Program (NEFOP)
East Falmouth, MA
At-Sea Monitor Groundfish Observer (February 2022)

- Coursework at the two-week training included practical field identification of fish, marine mammal, sea bird, and turtle species of the U.S. Atlantic Ocean, including species commonly found in the Gulf of Mexico and Gulf of Maine
- Trained in biological sampling of marine mammals, seabirds, and Atlantic sturgeon, and sea turtle sampling and resuscitation techniques (ESO approved training course)
- Trained to document various marine behaviors, such as milling, traveling, and feeding
- Trained to provide detailed information for certain species, such as right whales and humpbacks, to assist in the identification of individuals. Observer documentation includes photographs, video, detailed drawings, body condition, behavior, etc.
- Other training included offshore survival and safety and first aid/CPR
- Successfully completed testing meeting the 85% or greater requirement.

Work Experience

NMFS Fisheries Observer

Fathom Resources, Point Judith, RI
February 2022 to Present

· Deploy at-sea on US commercial fishing vessels targeting Northeast Groundfish species
· Obtain biological catch level data
· Cover gear types to include Trawl, gillnet, handline and longline

Laboratory Technician

Aerotek Recruiting/SGS Accutest inc. - Dayton, NJ
September 2021 to February 2022

· Perform extractions of client supplied water samples taken from bodies of water throughout the US
· Operate hot water baths and mixers to reduce liquid content and centrifuge sample.
· Prepare samples for molecular analysis to determine composition.

Marine Science Intern

New Logic Marine Science - Camp Tom's River, NJ
June 2021 to September 2021

· Identify and take inventory of all marine species that are caught, creating a comprehensive log of findings
· Conduct water quality tests including checking Ph and salinity levels and record in Excel
· Teach marine science lessons and activities for campers ages 5-13

Environmental Specialist (Seasonal)

Friends of Hopewell Valley Open Space - Titusville, NJ
June 2020 to December 2020

· Mapped and removed populations of 20+ species of invasive plants on 15+ government and private land plots
· Used ArcGIS to identify potential areas for invasive species, prepare reports, and updated program with new data

Field Tech (Seasonal)

Mercer County Mosquito Control - West Trenton, NJ
June 2018 to August 2018

· Visited properties from abandoned properties to private land and identified water sources with likely to host mosquitos and used various treatments designed to kill larvae
· Set mosquito traps in 20+ locations and recovered and reset each trap multiple times a week
·

Intern

Tetra Tech, Inc - Parsippany, NJ
July 2017 to August 2017

· Provided administrative support for the Passaic River Environmental Restoration Project

Open Space Intern

Princeton Township and Ecological Solutions - Princeton, NJ
June 2016 to September 2016

· Conducted fieldwork to remove 15+ species invasive species within 10+ public parks and updated findings using GIS

Biology Intern

College of New Jersey - Trenton, NJ
June 2015 to September 2015

· Interned with Dr. Donald J. Hirsh, Associate Professor of Chemistry
· Conducted experiments using lab equipment and logging results
· Results published in A Liposome-Encapsulated Spin Trap for the Detection of Nitric Oxide

Education

Bachelor of Arts in Marine Biology

Roger Williams University - Bristol, RI
May 2019

research
Bermuda Institute for Ocean Science
August 2017 to December 2017

Skills

- GIS
- Report Writing
- Environmental Science
- Field Work
- Water quality testing
- Health and Safety Standards
- Zoology
- Equipment Maintenance
- Field Data Collection
- Natural Resources Management

- Land Development
- Species Identification
- Ecology
- Life Sciences
- Scuba Diving
- Delivering Results
- GPS
- MS Office
- Environmental Protection & Policies
- Data Entry
- Data Analysis
- Logistics
- Safety Training
- Transportation of Equipment
- Environmental Assessments
- CPR certification
- First Aid
- Statistics
- Mathematics
- Entomology
- Physics

Certifications and Licenses

First Aid Certification

CPR Certification

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Nikole Andre

On June 7, 2022
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

Work Experience

Fathom Resources, LLC, Middletown, RI
Protected Species Observer Training (June 2022)

- Trained in the PSO position and duties of a PSO
- Trained in the governing regulations to include MMPA and ESA
- Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
- Trained in data recording to include required data fields and submission timelines
- Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
- Trained in safety and professional conduct
- Successfully completed testing meeting the 85% or greater requirement.

National Marine Fisheries Service, Northeast Fisheries Observer Program (NEFOP)
East Falmouth, MA
Industry Funded Scallop Observer trained (May 2022) & At-Sea Monitor Groundfish Observer (October 2022)

- Coursework at the three-week (IFS) & one-week cross training (ASM) included practical field identification of fish, marine mammal, sea bird, and turtle species of the U.S. Atlantic Ocean, including species commonly found in the Gulf of Mexico and Gulf of Maine
- Trained in biological sampling of marine mammals, seabirds, and Atlantic sturgeon, and sea turtle sampling and resuscitation techniques (ESO approved training course)
- Trained to document various marine behaviors, such as milling, traveling, and feeding
- Trained to provide detailed information for certain species, such as right whales and humpbacks, to assist in the identification of individuals. Observer documentation includes photographs, video, detailed drawings, body condition, behavior, etc.
- Other training included offshore survival and safety and first aid/CPR
- Successfully completed testing meeting the 85% or greater requirement.

- Complete at-sea deployments on Northeast Scallop and Groundfish vessels
- Obtaining biological catch level data on commercial fishing vessels
- Gear types include Trawl, dredge, gillnet, longline and handline

Work Experience

NMFS Fisheries Observer

Fathom Resources. New Bedford, MA May 2022 to Present

- Complete at-sea deployments on US commercial fishing vessels
- Collect scientific data to include biological catch level data
- Gear types include Trawl, dredge, gillnet, longline and handline

Laboratory Technician

Algafeed - Jupiter, FL
February 2021 to May 2022

- Collecting algae samples from tanks
- Analyzing health of algae cultures under a microscope
- Maintaining static cultures in tubes and flasks
- Maintaining active cultures in bottles, carboys, and tanks
- Measuring nitrogen content using UV-Spectroscopy
- Cell counts using an improved Neubauer counting chamber
- Cell counts using a Muse Flow Cytometer
- Measuring chemicals on milligram and gram scales
- Mixing chemicals
- Calculating and dispersing nutrients to cultures

Sales associate

Madewell - Palm Beach Gardens, FL
October 2016 to October 2021

- Setting up displays
- Restocking merchandise
- Working a register
- Aiding customers
- Organizing inventory / inventory intake
- Preparing online orders for shipment

Seasonal water quality tech

Clarke - Wellington, FL
May 2020 to February 2021

- Responsible for the application of appropriate herbicide and/or algaecide to control or eliminate invasive aquatic plants and algae species

- Responsible for inspection of mosquito breeding sites (setting mosquito traps)
- Larviciding applications using backpack sprayer
- Sentinel chicken surveillance and adulticiding applications while driving a truck and/or All-Terrain Vehicle (ATV) with attached sprayer
- Invasive species mitigation

Internship

Sea Venture clam co - Fort Pierce, FL
October 2019 to December 2019

- Inoculation of algae
- algae cell counts
- cleaning tanks
- caring for juvenile clams and brood stock

Undergraduate Research Assistant

Monmouth University - West Long Branch, NJ
September 2017 to May 2019

Dr. Phifer-Rixey- Faculty Mentor

- Summer Research Program
- DNA extractions
- Polymerase Chain Reactions
- Running Electrophoresis Gels
- Scientific Research Symposium

Study abroad In the Bahamas - January 2019

- Long spined sea urchin surveys
- Conch Midden Surveys
- Mangrove dispersal surveys
- Collecting Water samples
- Australian pine Surveys

Intern

Palm Beach County - West Palm Beach, FL
June 2017 to August 2017

Environmental Resource Management

- Public outreach with K-12 Summer Camps

Veterinary Assistant

Rainforest clinic for birds and exotics - Loxahatchee, FL
August 2014 to May 2015

Responsible for basic animal care

- Making appointments and managing the front desk
- Cleaning and restocking exam rooms

Education

BS in Marine and Environmental Biology and Policy

Monmouth University - West Long Branch, NJ
August 2019

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Harold Rigg

On October 29, 2022
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

Harold "Andrew" Rigg

Professional Training

Fathom Resources, LLC, Middletown, RI
Protected Species Observer Training (October 2022)

- Trained in the PSO position and duties of a PSO
- Trained in the governing regulations to include MMPA and ESA
- Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
- Trained in data recording to include required data fields and submission timelines
- Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
- Trained in safety and professional conduct
- Successfully completed testing meeting the 85% or greater requirement.

National Marine Fisheries Service, Northeast Fisheries Observer Program (NEFOP)
East Falmouth, MA
At-Sea Monitor Groundfish Observer (June 2022)

- Coursework at the two-week training included practical field identification of fish, marine mammal, sea bird, and turtle species of the U.S. Atlantic Ocean, including species commonly found in the Gulf of Mexico and Gulf of Maine
- Trained in biological sampling of marine mammals, seabirds, and Atlantic sturgeon, and sea turtle sampling and resuscitation techniques (ESO approved training course)
- Trained to document various marine behaviors, such as milling, traveling, and feeding
- Trained to provide detailed information for certain species, such as right whales and humpbacks, to assist in the identification of individuals. Observer documentation includes photographs, video, detailed drawings, body condition, behavior, etc.
- Other training included offshore survival and safety and first aid/CPR
- Successfully completed testing meeting the 85% or greater requirement.

- Complete at-sea deployments on Northeast Scallop and Groundfish vessels
- Obtaining biological catch level data on commercial fishing vessels
- Gear types include Trawl, dredge, gillnet, longline and handline

Experience

National Marine Fisheries Service- Fisheries Observer *June 2022- Present) – New Bedford, MA*

- Complete at-sea deployments on US commercial fishing vessels targeting Northeast Groundfish species.
- Obtain biological catch level data
- Gear types include trawl, gillnet, longline and handline

GVI Coral Reef Research Internship *(Summer 2021) - Puerto Morelos, MX*

- Participated in Coral Watch excursions in order to identify species richness and concentrations of stressed coral within different sites along the Mesoamerican Barrier Reef.
- Underwent research in identifying diseased corals in relation to the specific

disease affecting them and used software to map out areas that possessed significant densities of diseased coral.
- Garnered the ability to identify 60+ coral species, 110+ fish species, and 20+ invertebrate species by scientific name within the Gulf of Mexico.
- Worked closely with the Mexican Department of Fisheries office (CONAPSECA) in identifying at risk areas within the Mesoamerican Barrier Reef
- Aided CONAPESCA in coral transplantation
- Earned a CRRD (Coral Reef Research Diver) specialty dive certification (PADI)

Aquarium of the Pacific *(Summer 2017 - 2020) – Long Beach, CA*
Summer Volunteer, tasked with various support roles and responsibilities, including:
- Docent for various exhibits; Magellanic penguin, shark and ray touch pools, and assorted touch labs
- Actively engaged in public education for different exhibits while working with guests from different backgrounds and ages
- Volunteered over 200 hours

Admiral Risty *(2019) – Palos Verdes Estates, CA*
Prep Cook for the upscale steak and seafood restaurant. Duties included:
- Cooking all soups and most of the sauces
- Prepping whole fish and steak marinades
- Prepping/Cleaning Shrimp for shrimp dishes on menu
- Anything else given by the various sous/chefs

Education

Eckerd College *(2018 – 2022) – St. Petersburg, FL*

- B.S. in Marine Biology and a minor in both Business Management and Anthropology
- Biological Sciences Tutor
- Member of Eckerd campus's Florida PIRG division
- Member of the Fishing Club, Herpetology Club

Palos Verdes High School *(2014 – 2018) – Palos Verdes Estates, CA*

- Graduated with Honors – 3.73 GPA
- California Scholarship Federation
- National Honors Society
- Science National Honors Society

Accolades & Skills

Florida Boating Safety Education ID Card (NASBLA)

- Valid in various other coastal states
- Gives the ability to legally operate vessels above 10 horsepower
- 30+ hours of underway training
- Learned how to operate various safety equipment such as fire extinguishers (both A and B types), stick flares, flare guns
- Experience in creating and executing the use of routes in order to safely navigate coastal areas.
- Possesses a certification of completion for the "Boat Control On-Water Training course"

PADI Certifications

- Open Water, Advanced Open Water
- CRRD (Coral Reef Research Diver) A specialty diver certification allowing for research to be done in similarly related ecosystems. I was trained in various types of research involving coral species / fish species identification as well as coral disease identification.

- Proficient in the Microsoft Office and Windows Desktop software
- Boy Scouts of America (First Class)
- Hobbies include: fishing, scuba diving, reading, gardening, hiking, exploring, and photography

Relevant Coursework

- Marine Invertebrate Biology: Studied the differences in life history, anatomy, physiology, and cellular processes of all major marine invertebrate phyla including their subphyla

- Cellular Processes: Gave a very detailed understanding of cellular composition and metabolic processes including major cellular cycles such as Krebs TCA cycle.
- Genetics: Went into detailed knowledge of DNA / Protein creation and replication as well as included numerous developmental studies that aided in the field of genetics. In the lab we took hemolymph of various sea turtles and over the course of two months extracted the DNA, sequenced it, and compared differences between the genetic makeup of same-species turtles.
- Comparative Animal Physiology: Detailed understanding on the differences in cellular biology (up to tissues and organs) between different animals based on their environment and needs in order to regulate cellular and metabolic functions.
- Geological Oceanography: Basic understandings of common marine sediment stratification as well as mineral and rock compositions (cleavage, composition). Also garnered knowledge about major ocean systems such as gyres, ekman flow, and how air currents move (ITCZ, cells, rain shadows) and its impact on ocean currents that subsequently impact sediment deposition.
- Principles of Ecology : Environmental interaction of freshwater and marine ecosystems including habitat zones. Also learned extensively about important contributions to the field of ecology and its progression over the past seven decades.
- Marine and Freshwater Botany: Provided me with detailed experience on different marine plant life histories as well as compositional anatomies of the major different groups of the subkingdoms of Plantae
- Chemical and Physical Oceanography: Detailed understanding of sediment transport and movement of major water masses as well as their composition. This course's material consisted of half conceptual information and half chemistry and physics equations (calculating residence time of water masses / concentration of HCO_3 / H_2CO_3 in water masses based on initial CO_2 input, aragonite concentrations, etc.)
- Calculus I, Calculus II
- Physics I, Physics II
- Chemistry I, Chemistry II, Organic Chemistry
- Statistics for Management / Economics: Provided me with ability to perform statistical tests but by using pen and paper. Some of these include finding confidence intervals, one-tailed and two-tailed hypothesis testing, calculating standard deviation and standard error, as well as many more.

Fathom Resources, LLC

855 Aquidneck Avenue, Unit 9, Middletown RI

THIS ACKNOWLEDGES THAT

Rhianna Clemons

On October 29, 2022
Has successfully completed
PROTECTED SPECIES OBSERVER TRAINING

Danielle Kane

DANIELLE KANE
TRAINING INSTRUCTOR

Rhianna Clemons

(270) 446-9581 | rclemons@bellarmine.edu

PROFESSIONAL TRAINING

Fathom Resources, LLC, Middletown, RI
Protected Species Observer Training (October 2022)

- Trained in the PSO position and duties of a PSO
- Trained in the governing regulations to include MMPA and ESA
- Trained in Species Identification to include understanding various marine behaviors, such as milling, traveling, and feeding.
- Trained in data recording to include required data fields and submission timelines
- Trained project types to include what to expect, normal work environments, exclusion zones, shut down requirements, communication methods, etc.
- Trained in safety and professional conduct
- Successfully completed testing meeting the 85% or greater requirement.

National Marine Fisheries Service, Northeast Fisheries Observer Program (NEFOP)
East Falmouth, MA
At-Sea Monitor Groundfish Observer (May 2022)

- Coursework at the two-week training included practical field identification of fish, marine mammal, sea bird, and turtle species of the U.S. Atlantic Ocean, including species commonly found in the Gulf of Mexico and Gulf of Maine
- Trained in biological sampling of marine mammals, seabirds, and Atlantic sturgeon, and sea turtle sampling and resuscitation techniques (ESO approved training course)
- Trained to document various marine behaviors, such as milling, traveling, and feeding
- Trained to provide detailed information for certain species, such as right whales and humpbacks, to assist in the identification of individuals. Observer documentation includes photographs, video, detailed drawings, body condition, behavior, etc.
- Other training included offshore survival and safety and first aid/CPR
- Successfully completed testing meeting the 85% or greater requirement.

- Complete at-sea deployments on Northeast Scallop and Groundfish vessels
- Obtaining biological catch level data on commercial fishing vessels
- Gear types include Trawl, dredge, gillnet, longline and handline

RELEVANT EXPERIENCE

National Marine Fisheries Observer
Fathom Resources, May 2022 – Present Neysa Call

- Complete at-sea deployment on board US commercial fishing vessels targeting Northeast Groudfish species.
- Obtain biological catch level data
- Gear types include Trawl, gillnet, longline and handline

National Aeronautics and Space Administration

Office of Chief Scientist Henry Clay Intern, June 2021 – August 2021
Mentors: Drs. Tara Ruttley and Neysa Call

- Competitively selected NASA intern in Office of Chief Scientist (OCS) at NASA Headquarters. One of two selected from Commonwealth of Kentucky.
- Worked with OCS to set organizational strategic direction, goals, priorities, and processes for upcoming year and corresponding action plan. Monitored progress of approved tasks and evaluated scientific readiness as well as real-time issues that could negatively affect scientific outcomes for NASA missions and agency portfolio.
- Served as agency scientific expert, overseeing research on sustainability for OCS with emphasis on sustaining the lunar environment. Ensured scientific integrity, inclusiveness, and transparency in developing NASA publication to define sustainability and ascertain research gaps for Artemis Program. Hosted series of meetings and workshops with scientific community to support development of definition through inclusive, peer-reviewed process. Final NASA publication presented in October 2021 at International Astronautical Congress 2021.
- Supported NASA's sustainability working group (>150 NASA and NSF scientists and other stakeholders) interested in sustainability in terms of long-term space habitation. Leveraged expertise from NSF and the scientific community it supports, especially pertaining to analog sites. Developed key connections to the U.S. Department of Defense, including the U.S. National Guard and U.S. Air Force, the Science and Technology Policy Institute, BioSphere II, and several other key stakeholders.
- Assisted in the development of a thorough, multi-media outreach plan to bring the science of sustainability to the public highlighting both NASA and NSF work. Dr. Call worked with a film company to produce a streaming series and giant screen film on sustainability in space, which has been picked up for production. It will feature NSF- and NASA-funded experts, following the Artemis program from inception to exploration of the exoplanets. This series will result in nearly 1 billion impressions around the globe.
- Worked with Drs. Jim Green, Dave Draper, Call, and USGS on a series of Rare Earth Minerals infographics, which the Chief Scientist used in several keynote presentations. I helped develop infographics, slides, and text, which will lead to a paper.

- In FY 2021, the National Science Foundation Budget's request to Congress provided $10.2 billion for NSF, including an increase of 20 percent to create a new Directorate for Innovation. To educate Congress on the research supported with these additional funds, I developed a series of branded fact sheets. Priorities included enhancing fundamental research and development, strengthening U.S. Leadership in Emerging Technologies, and Advances in Climate Science and Sustainability Research.
- Participated in NASA's Unity conversations and worked with the author and illustrator of an upcoming new book, "We Are All Apollo." Contributed content to foster diversity and inclusion in STEM fields and provided authors with leads for content in book.

Bellarmine University, Honors Program
Honors Senior Thesis, August 2020 – Present
Advisor: Dr. Roberta Challener; Committee: Dr. Steven Wilt and Dr. Kate Bulinski

- Examining the effects of increasing ocean temperatures on the survivorship of a subtropical population of the sea urchin *Arbacia punctulata*
- Design and carry out experimental protocol. Collect data for analysis and presentation. Present results at scientific conference.
- Husbandry and management of urchin environment (produced over 200 gallons of artificial sea water; established 24 aquariums with appropriate micro-environment (seed, salinity, temperature for urchin).

Bellarmine University, Department of Environmental Studies
Undergraduate Assistant Work Study, August 2018 – Present

- Analyze and sterilize creek samples, preventing contamination from *E. coli.*
- Assist faculty and senior students with data analysis and field work research, including water quality tests, GIS, and curating fossil collection.
- Maintained two fully stocked, organized laboratories, organizing and sterilizing scientific equipment such as microscopes and glassware used in research and teaching laboratories.
- Calibrated research-grade scientific equipment, including a YSI multiparameter instrument, temperature probes, etc., for wetland use.
- Served as Department of Environmental Studies Search Committee Student Representative.

Bellarmine University, AMBROSIA Project
Student Researcher, August 2019 – March 2020
Advisor: Dr. David Robinson

- Collected, labeled, and maintained common and giant ragweed species to isolate samples to examine for allergen-causing gene, Amb5.
- Utilized polymerase chain reaction, gel electrophoresis, and litigation to clone DNA containing the Amb5 gene.
- Sequenced DNA to find possible mutations regarding allergen-causing gene in species outside of Kentucky.

Morehead State University, SEA-PHAGES Project
Student Researcher, January 2017 – January 2018
Advisor: Dr. David Peyton

- Cultivated, isolated, and harvested bacteriophages from environmental samples.
- Sequenced genome of MuchMore bacteriophage using PECAAN.
- Credited as reference author for mycobacteriophage MuchMore on National Center for Biotechnology Information Database (NCBI) website.

EDUCATION

Bellarmine University, Louisville, KY
Bachelor of Science, Environmental Science; GPA: 3.9 May 2022
Bachelor of Arts, Political Science; GPA: 3.9 May 2022
Minor, Biology

- *Relevant Coursework*: Calculus II, Organic Chemistry, Honors Statistics, Sustainable Development, Environmental Geology, Animal Diversity, Deep Ecology, Ecology, Paleontology, Physics

ABSTRACTS/PUBLICATIONS

"NSF Update on Atmospheric Science and Climate Change." December 1, 2021. E. Zelenski, N. Call, R. Clemons. Prepared for Dr. Alex Isern, Assistant Director for Geosciences, National Science Foundation. Presented to National Academy of Sciences Board on Atmospheric Science and Climate (IBASC) Fall Meeting.

"Milestones for Humans on Mars." N. Call, R. Clemons, S. Hornback, T. Ruttley, C. Walker. Infographics prepared for USGS/NASA Critical Minerals Effort. November 26, 2021.

T. Ruttley, N. Call, P. Besha, S. Scimemi, R. Clemons, S. Hornback, D. Kennedy, C. Jones, J. Green. Oct. 25-29, 2021. "Back to Stay: NASA's Campaign to Sustainably Return Humans to the Moon." 72nd International Astronautical Congress, Dubai, United Arab Emirates, International Astronautical Federation.

R. Clemons. "NASA: A Sustainable Artemis Program." August 12, 2021. Invited Presentation to Bellarmine University Honors Program.

"Ideas to Impacts" E. Zelenski, N. Call, R. Clemons. August 11, 2021. Prepared for Dr. Barbara Ransom, NSF Directorate for Geosciences Program Manager for the Geoscience Innovation Hub. NSF Webinar Series.

"The Planets." July 8, 2021. D. Raksany, N. Call, T. Ruttley, R. Clemons. Presentation, Treatment and Trailer prepared for Dr. James Green, NASA Chief Scientist. Presented to NASA Film Production Staff.

"Driving Forces for Climate Change Investment." June 2021.
N. Call, R. Clemons, E. Zelenski. Presentation prepared for Dr. Anjuli Bamzai, NSF Senior Science Advisor, Global Climate Change. OMB Briefing.

"GEO News and Views." May 24, 2021. R. Clemons, N. Call, E. Zelenski. Newsletter for Directorate for Geosciences. National Science Foundation.

"Artemis: NASA's Sustainable Mission to the Moon and Mars." May 12, 2021. N. Call, R. Clemons. Presentation prepared for Dr. James Green, NASA Chief Scientist. Presented to Grant County School District, Kentucky.

Clemons, R.P., McElroy, D.M., Robinson, M.R., Walsburger, C.S., and Peyton, D.K. "Cultivation, Isolation and Harvest of Novel Bacteriophage from Environmental Samples." Small Genomes Discovery Program Symposium, January 27, 2018, Western Kentucky University, Bowling Green, Kentucky.

LEADERSHIP/SERVICE

Bellarmine University Sustainability Council
SGA Representative, August 2021- Present
Bellarmine University Student Government Association
Environmental Chair, May 2021 – Present
Bellarmine University Pi Sigma Alpha- Alpha Theta Pi Chapter
President, April 2021 – Present
Bellarmine University Leading Women of Tomorrow
Secretary and Treasurer, January 2019 - Present
Bellarmine University Pi Sigma Alpha- Alpha Theta Pi Chapter
Treasurer, March 2019 – April 2020
American Cancer Society Making Strides Against Breast Cancer Walk
Volunteer, October 2019
Bellarmine University Colleges Against Cancer
President, August 2019 – July 2020

HONORS AND GRANTS

- Constitutional Symposium Panelist, Bellarmine University (2021, 2022)
- Honors Banquet Student Research Presentation, Bellarmine University (2021)
- Civic Week Panelist, Bellarmine University (2021)
- Professional Excellence Award, Bellarmine University (2021)
- Joe and Angela Schmidt Honors Research Award, Bellarmine University (2021-present)
- Presidential Scholarship Recipient, Bellarmine University (2020, 2021)
- Dean's List, Bellarmine University (2018–present)
- Bellarmine Honors Program (2018–present)

TECHNICAL SKILLS

Computational: Autodesk Inventor, Microsoft Office Suite, Google Suite, ArcGIS, Zoom, Canva, IBM SPSS

Field: Greenhouse management and horticulture science, Water quality tests, YSI Multiparameter instrument, field notes/record keeping, field safety, sample collection, observation

Laboratory: Data analysis, genome sequencing, genetic cloning, SDS-PAGE (sodium dodecyl sulfate polyacrylamide gel electrophoresis), agarose gel electrophoresis, dissection, pipette including micropipette, titration, prepare media, chromatography, spectrophotometers, conduct statistical analysis, communicate findings using models, charts, and graphs, communicate biological research findings using scientific writing, slide making, polymerase chain reaction machines, replica plating, blotting including Western Blot, growth of competent cells, biohazard level 2

Other: First Aid CPR, Defibrillator, NASA Apollo 1 Case Study, NASA Leading by Motivating

Greetings Danielle:

Thank you for your interest in obtaining approval from NOAA's National Marine Fisheries Service (NMFS) for Nicole Milligan to work as a Protected Species Observer (PSO). We have reviewed her credentials and made the following determinations:

- She meets the NMFS training and experience recommendations for PSOs serving at general nearshore construction projects such as pile driving, explosive demolitions, mechanical dredging, and dredged material disposal;
- She meets the "conditional" NMFS training and experience recommendations for PSOs serving aboard hydraulic hopper dredges. See our website for any additional on-the-job training.

Please note that this approval is only valid for activities noted above, such as nearshore construction, demolitions, or maintenance activities in the Western Atlantic Ocean and/or Gulf of Mexico. This approval is not applicable to seismic surveys. For more information on, or PSO approval for, any other type of geophysical surveys, please contact nmfs.psoreview@noaa.gov. Further, this approval is not applicable to the Northeast Fisheries Observers Program or the Platform Removal Observer Program. Please ensure that you retain a copy of this email approval for your records and that

she carries a copy while conducting PSO duties. We appreciate your efforts in the conservation of threatened and endangered species and look forward to working with you in the future.

Sincerely,

H. Max Tritt
Fishery Biologist
Greater Atlantic Fisheries Office
National Marine Fisheries Service
17 Godfrey Drive, Suite 1
Orono, ME. 04473
Tel: 207.866.3756
Fax: 207.866.7342

PSO Epproval **10/4/2021**

Greetings Danielle:

Thank you for your interest in obtaining approval from NOAA's National Marine Fisheries Service (NMFS) for the following individuals to work as Protected Species Observers (PSOs):

1. Nicolas Holtmeier
2. Sierra Mahoney
3. Colleen Rodenbush
4. Hannah Mabile
5. William Botta
6. Sarah Knowlton

We have reviewed their credentials and made the following determinations:

They meet the NMFS training and experience recommendations for PSOs serving at general nearshore construction projects such as pile driving, explosive demolitions, mechanical dredging, and dredged material disposal; and

They meet the NMFS "conditional" training and experience recommendations for PSOs serving aboard hydraulic hopper dredges. See our website for additional on-the-job training;

Please note that this approval is only valid for activities noted above, such as nearshore construction, pile driving, demolitions, dredging, and spoils disposal in the Western Atlantic Ocean and Gulf of Mexico.

For more information on PSO approval for geophysical surveys, such as bottom profiling using sonar or other electromagnetic devices or for seismic surveys that use air guns, please contact nmfs.psoreview@noaa.gov. Further, this approval is not applicable to the Northeast Fisheries Observers Program or the Platform Removal Observer Program.

Please ensure that you retain a copy of this email approval for your records and that they carry a copy while conducting PSO duties. We appreciate your efforts in the conservation of protected species and look forward to working with you in the future.

Sincerely,

TRITT.HOWARD.M.1077677387

Digitally signed by TRITT.HOWARD.M.1077677387
Date: 2021.10.04 14:27:40 -04'00'

H. Max Tritt
Fishery Biologist
Greater Atlantic Fisheries Office
National Marine Fisheries Service
17 Godfrey Drive, Suite 1
Orono, ME. 04473
Tel: 207.866.3756
Fax: 207.866.7342

United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Greater Atlantic Region
55 Great Republic Drive
Gloucester, MA 01930

June 10, 2020

Danielle Kane
PSO Department Head
Fathom Resources, LLC
855 Aquidneck Avenue, Unit 9
Middletown, RI 02842

Re: Protected Species Observer Approval

Dear Ms. Kane:

Thank you for your interest in obtaining approval from NOAA's National Marine Fisheries Service (NMFS) for the following individuals to work as Protected Species Observers (PSOs).

Jonathan D Morgan	**Shannon McCarthy**
Jessica Ahlers	**Michelle Greene**
Kevin Anderson	

We have reviewed their credentials to determine if they have sufficient training and experience to effectively monitor for protected species interactions.

Construction, Blasting, and Pile Driving
All of the individuals listed above possess sufficient training and experience to be considered NMFS approved observers qualified for general construction projects, including pile driving and explosive demolitions (blasting projects). This determination is based on their education, training, and previous experience conducting various types of environmental monitoring.

Dredging and Dredged Material Disposal
All of the individuals listed above have sufficient training and experience to be considered NMFS approved PSOs qualified to monitor for interactions with listed species on mechanical dredging projects. They are approved for PSO work that may be required in association with dredged material disposal operations.

Further, all of the individuals listed above are considered *conditionally* approved PSOs for hydraulic hopper dredging projects. However, before they can stand independent watches aboard hopper dredges, they must fulfill certain requirements. These requirements involve adhering to the following conditions: (1) During the first 12 hours as a shipboard watchstander, the candidate must be trained and supervised by an *unconditionally* approved PSO; (2) For the following 48 hours as a shipboard watchstander the candidate may stand independent watches, but another *unconditionally* approved PSO must be onboard the dredge to provide assistance and confirmation of species identification. Upon completion of these requirements, confirmation of the completion should be submitted to us. We will then provide a notification stating that the candidate is *unconditionally* approved to monitor interactions with listed species aboard hopper dredges.

We appreciate your efforts in the conservation of threatened and endangered species and look forward to working with you in the future. Please ensure that you retain a copy of this letter for your records, and observers carry a copy of this letter while conducting protected species observer duties. This approval is valid for projects in both the Greater Atlantic and Southeast Regions of the U.S. that may require PSOs. However, this approval is not applicable for the National Fisheries Observer Program, or the Platform Removal Observer Program conducted by NMFS Southeast Fisheries Science Center. If you have any questions about these comments, please contact Max Tritt of my staff at (207) 866-3756 or Max.Tritt@noaa.gov.

Sincerely,

Jennifer Anderson

Jennifer Anderson
Assistant Regional Administrator
for Protected Resources

EC: Tritt, Kane
File Code: Endangered Species Observers File 2020

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

SEP 1 8 2019

Danielle Kane
PSO Department Head
Fathom Resources, LLC
855 Aquidneck Avenue, Unit 9
Middletown, RI 02842

Re: Protected Species Observer Approval

Dear Ms. Kane:

Thank you for your interest in obtaining approval from NOAA's National Marine Fisheries Service (NMFS) for the individuals listed below to work as Protected Species Observers (PSOs). We have reviewed their credentials to determine if they have sufficient training and experience to effectively monitor for protected species interactions.

Angelina Martin	**Tucker Lucey**
David Lockwood	**Jordan Spalla**
Morgan Anthony	**Megan Barry**
Monique Arsenault	**Danielle Kane**
Joseph Irwin Sims	**Kyle Miller**

Construction, Blasting, and Pile Driving
The individual listed above possess sufficient training and experience to be considered NMFS approved observers qualified for general construction projects, including pile driving and explosive demolitions (blasting projects). This determination is based on their education, training, and previous experience conducting various types of environmental monitoring.

Dredging and Dredged Material Disposal
The individual listed above have sufficient training and experience to be considered NMFS approved PSOs qualified to monitor for interactions with listed species on mechanical dredging projects. They are also approved for PSO work that may be required in association with dredged material disposal operations. They are considered *conditionally* approved protected species observers for hydraulic hopper dredging projects. However, before they can stand independent watches aboard hopper dredges, they must fulfill certain requirements. These requirements involve adhering to the following conditions: (1) During the first 12 hours as a shipboard watchstander, the candidates must be trained and supervised by an *unconditionally* approved PSO; (2) For the following 48 hours as a shipboard watchstander the candidates may stand independent watches, but another *unconditionally* approved PSO must be onboard the dredge to provide assistance and confirmation of species identification. Upon completion of these requirements, completion confirmation should be submitted to us. We will then provide a letter

stating that the candidates are *unconditionally* approved to monitor interactions with listed species aboard hopper dredges.

We appreciate your efforts in the conservation of threatened and endangered species and look forward to working with you in the future. Please ensure that observers carry a copy of this approval letter while conducting protected species observer duties. This approval is valid for projects in both the Greater Atlantic and Southeast Regions of the U.S. that may require PSOs. However, this approval is not applicable for the National Fisheries Observer Program, or the Platform Removal Observer Program conducted by NMFS Southeast Fisheries Science Center's Galveston Laboratory. If you have any questions about these comments, please contact Max Tritt of my staff at (207) 866-3756 or Max.Tritt@noaa.gov.

Sincerely,

Jennifer Anderson
Assistant Regional Administrator
for Protected Resources

EC: Tritt, Kane
File Code: Endangered Species Observers File 2019

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

FATHOM RESOURCES, LLC
Danielle Kane
855 Aquidneck Avenue
Unit 9
Middletown, RI 02842

Greetings Danielle,

Thank you for your interest in obtaining approval from NOAA's National Marine Fisheries Service (NMFS) for the following individuals serve as Protected Species Observers (PSOs):

Nikole Andre	Harold Rigg
Stewart Michie	Ethan Jordan
Devan Driscoll-Roach	Rhianna Clemons

We have reviewed their credentials and made the following determinations:

They meet the NMFS training and experience recommendations for PSOs serving at general nearshore construction projects such as pile driving, explosive demolitions, dredging, and dredged material disposal; and

They also meet the NMFS "conditional" training and experience recommendations for PSOs serving aboard hydraulic hopper dredges. See our website for additional on-the-job training.

Please note that this approval is only valid for activities noted above, such as nearshore construction, pile driving, demolitions, dredging, and spoils disposal in the Western Atlantic Ocean and Gulf of Mexico.

For more information on PSO approval for geophysical surveys, such as bottom profiling using sonar or other electromagnetic devices or for seismic surveys that use air guns, please contact nmfs.psoreview@noaa.gov. Further, this approval is not applicable to the Northeast Fisheries Observers Program or the Platform Removal Observer Program.

Please ensure that you retain a copy of this approval for your records and that they carry copies while conducting PSO duties. We appreciate your efforts in the conservation of protected species and look forward to working with you in the future.

Sincerely,

H. Max Tritt
Fishery Biologist
Greater Atlantic Fisheries Office
National Marine Fisheries Service
17 Godfrey Drive, Suite 1
Orono, ME. 04473
Tel: 207.866.3756

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