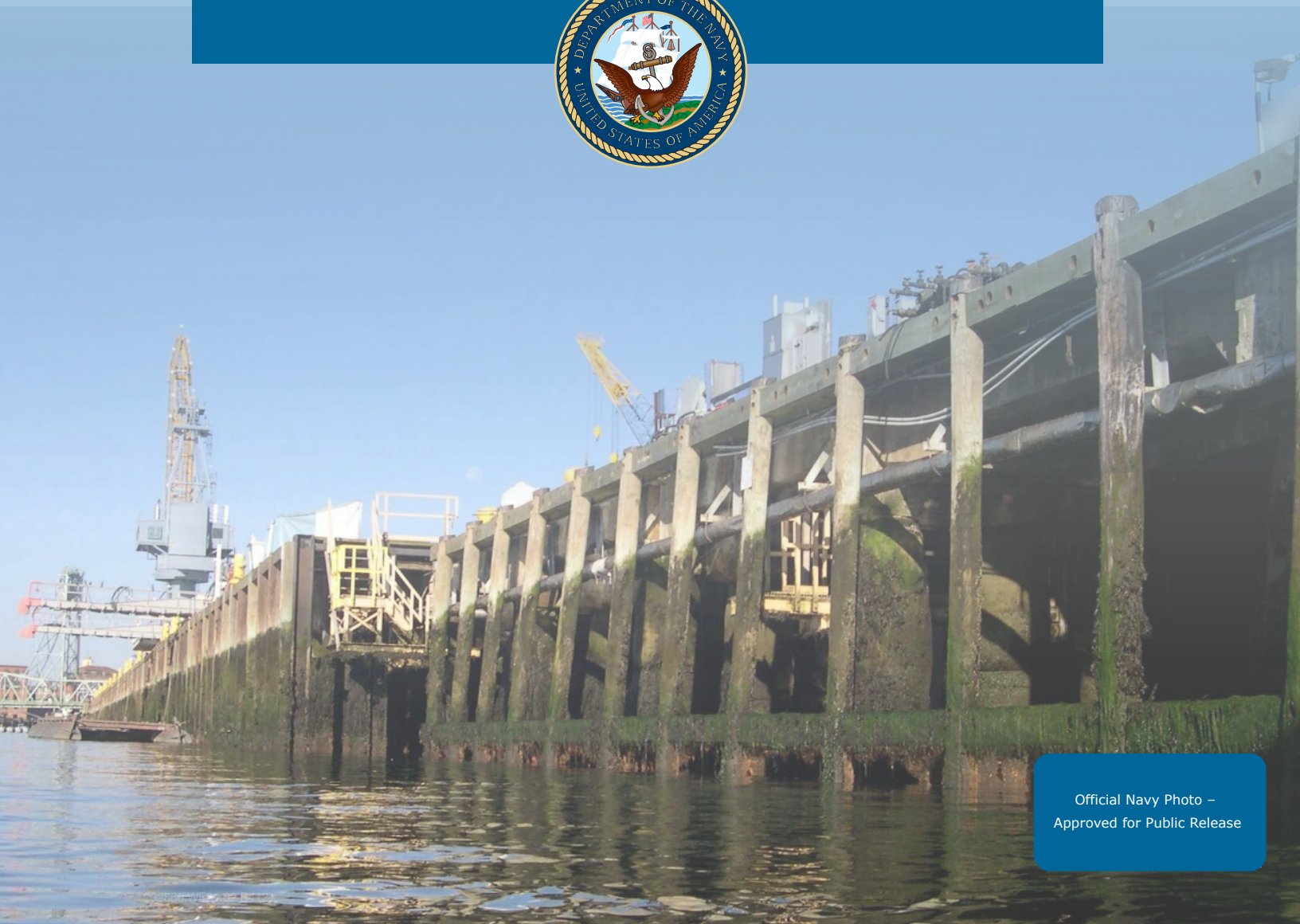
Version 2

Environmental Assessment for Waterfront Improvement Projects at Portsmouth Naval Shipyard, Kittery, Maine

February 2016

Department of the Navy



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Environmental Assessment for Waterfront Improvement Projects

at

Portsmouth Naval Shipyard, Kittery, Maine

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Abstract

Designation:	Environmental Assessment
Title of Proposed Action:	Waterfront Improvement Projects
Project Location:	Portsmouth Naval Shipyard, Kittery, Maine
Lead Agency for the EA:	Department of the Navy
Cooperating Agency:	None
Affected Region:	York County, Maine
Action Proponent:	Commanding Officer, Portsmouth Naval Shipyard
Point of Contact:	Ms. Danna Eddy, Public Affairs Officer, 100PAO Portsmouth Naval Shipyard Building 86 Portsmouth, New Hampshire, 03804-5000 E-mail address: Danna.Eddy@navy.mil
Date:	February 2016

The Department of the Navy has prepared this Environmental Assessment in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality Regulations and Navy regulations for implementing NEPA. The Proposed Action would restore and modernize waterfront infrastructure associated with Dry Docks 1 and 3 at Portsmouth Naval Shipyard in Kittery, Maine, between 2016 and 2022. The Proposed Action would modernize and maximize dry dock capabilities for performing current and future missions efficiently and with maximum flexibility. This EA evaluates the potential environmental impacts associated with the two action alternatives, Alternative 1 (Preferred Alternative) and Alternative 2, and the No-Action Alternative to the following resource areas: air quality, water resources, bathymetry, cultural resources, marine biological resources, visual resources, airborne noise, infrastructure, transportation, and hazardous materials and wastes.

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EXECUTIVE SUMMARY

Proposed Action

The U.S. Department of the Navy (the Navy) proposes to restore and modernize waterfront infrastructure associated with Dry Docks 1 and 3 at Portsmouth Naval Shipyard (the Shipyard), located in Kittery, York County, Maine (see Figure ES-1). The Proposed Action would include the following two waterfront improvement projects: structural repairs to Berths 11, 12, and 13 and replacement of the Dry Dock 3 caisson. The waterfront improvement projects would be constructed in phases between October 2016 and October 2022.

The Navy has prepared an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) regulations and Navy regulations for implementing NEPA. The action proponent is the Commanding Officer, Portsmouth Naval Shipyard. No cooperating agencies were involved in preparation of this EA.

Purpose of and Need for the Proposed Action

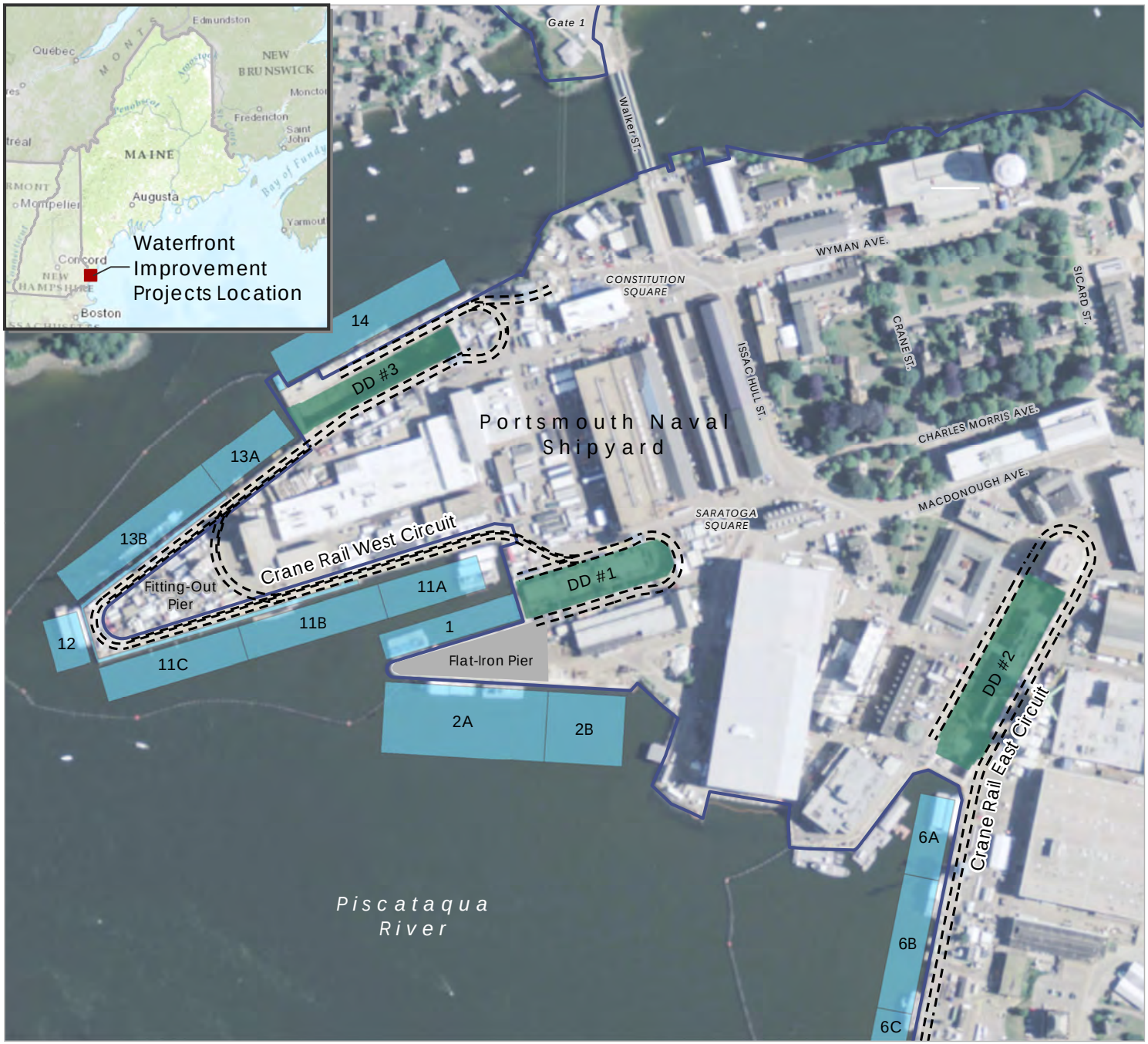
The purpose of the Proposed Action is to modernize and maximize dry dock capabilities for performing current and future missions efficiently and with maximum flexibility. The Proposed Action is needed to correct deficiencies in waterfront facilities and infrastructure and ensure that the Shipyard can continue to support its primary mission to service, maintain, and overhaul submarines. By supporting the Shipyard's mission, the Proposed Action would assist in meeting the larger need for the Navy to provide capabilities for training and equipping combat-capable Naval forces ready to deploy worldwide. In this regard, the Proposed Action furthers the Navy's execution of its congressionally mandated roles and responsibilities under 10 United States Code [U.S.C.] Section 5062.

Alternatives Considered

Alternatives were developed for analysis based upon the following reasonable alternative screening factors:

- preventing further loss of portal crane rail load-bearing capacity at Berths 11, 12, and 13
- providing adequate corrosion protection at Berths 11, 12, and 13
- restoring load-bearing capacity at Berths 11, 12, and 13 sufficient to support a minimum 78,000-pound (39-ton) operational load-bearing capacity
- restoring the condition of the Dry Dock 3 caisson so that it meets the requirements of the Naval Sea Systems Command (NAVSEA) Safety Certification Program
- allowing for in-water and upland construction work to occur during times that would not conflict with Shipyard mission schedules
- reducing the Navy's total cost of ownership—i.e., the frequency and cost of maintenance work on waterfront infrastructure
- improving operational efficiencies in and around Dry Docks 1 and 3

The Navy is considering two action alternatives that meet the purpose and need for the Proposed Action and a No Action Alternative.



ES-1
Dry Docks, Berths, and the Portal Crane Rail System
Portsmouth Naval Shipyard
York County, Maine

Legend

- Dry Dock
- Berth
- Installation Area
- Portal Crane Rail

N

0 250 500 750 Feet

Source: ESRI 2013; Department of Defense 2014.

Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\DOPPA\ES_1_Dry Docks and the Portal Crane Rail System.mxd 1/25/2016

Alternative 1 (Preferred Alternative) includes two waterfront projects, 1) structural repairs to Berths 11, 12, and 13, consisting of constructing king pile and concrete shutter panel bulkheads around these berths, and 2) replacement of the Dry Dock 3 caisson (or gate). The Preferred Alternative would incorporate in-water construction techniques for both projects that would require less pile driving, potentially reducing impacts on in-water resources, including marine mammals, fish, and benthic communities, and airborne noise impacts on communities near the Shipyard.

Alternative 2 includes the same waterfront projects that would be implemented under Alternative 1. Under Alternative 2, conventional steel sheet-pile bulkheads would be constructed around Berths 11, 12, and 13. At Dry Dock 3, a temporary cofferdam would be constructed to provide a dry work area in order to allow more extensive repairs at this location. Alternative 2 would incorporate different in-water construction techniques for both projects that would require a greater number of piles and thus more pile driving than Alternative 1.

The No Action Alternative would not result in any changes to waterfront infrastructure at the Shipyard. The infrastructure and operational deficiencies described in Chapter 1 of the EA would not be addressed, with serious consequences to the Shipyard's ability to meet mission requirements. Because it would fail to support mission requirements, the No Action Alternative would not meet the purpose and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis in this EA and provides a baseline for measuring the environmental consequences of the action alternatives.

Summary of Environmental Resources Evaluated in the EA

CEQ regulations, NEPA, and Navy instructions for implementing NEPA specify that an EA should address those resource areas potentially subject to impacts. In addition, the level of analysis should be commensurate with the anticipated level of environmental impact.

Several important existing resources were analyzed in the EA. They include surface waters, architectural resources that are considered historic properties eligible for listing on the National Register of Historic Places (NRHP), marine mammals, essential fish habitat, threatened and endangered species, and airborne noise.

The following resource areas have been addressed in this EA: air quality, water resources, bathymetry, cultural resources, marine biological resources (marine vegetation, marine mammals, fish, benthic invertebrates, benthic habitat, and marine threatened and endangered species), visual resources, airborne noise, infrastructure, transportation, and hazardous materials and waste. Because potential impacts to them were considered to be negligible or nonexistent, the following resources were not evaluated in this EA: groundwater, topography, geology and soils, terrestrial biological resources, terrestrial threatened and endangered species, land use, potable water and wastewater, airspace, public health and safety, socioeconomics, and environmental justice.

Summary of Potential Environmental Consequences of the Action Alternatives and Major Mitigating Actions

Surface Water. Short-term impacts on surface water quality in the Piscataqua River would result from dredging, filling, and dewatering during construction. The proposed Berths 11, 12, and 13 structural repairs project would be required to comply with the conditions of an individual USACE permit and a Maine Department of Environmental Protection (MEDEP) individual Natural Resources Protection Act (NRPA) permit that will be obtained before the start of construction. The Berths 11, 12, and 13 structural

repairs would require filling approximately 98,800 square feet to 118,800 square feet (with Option 1) of the previously filled area beneath the pier and the Piscataqua River bottom within 5 feet of the existing berth faces. Approximately 1,142,000 cubic feet to 1,405,000 cubic feet (with Option 1) of fill would be required. The area that would be filled and amount of fill required would be minimized to the maximum extent practicable by constructing the bulkheads within 5 feet of the existing faces of the berths. Compensatory mitigation for the loss of coastal habitat functions and values as a result of the proposed fill will occur in the form of an in-lieu fee paid to the Maine Department of Environmental Protection (DEP) prior to the start of construction in accordance with the Maine Natural Resources Protection Act (38 M.R.S.A. §480-Z), Sections 404 and 401 of the Clean Water Act (33 U.S.C. §1251 et seq.), and Section 10 of the Rivers and Harbors Act (33 U.S.C. §403 et seq.). Fees paid under the Maine In-Lieu Fee Compensation Program are used under the Maine Natural Resources Conservation Program for restoration, enhancement, creation, and preservation of Maine's protected natural trust resources, typically in the same biophysical region in which the impacts would occur.

No dredging or fill would be required for the Dry Dock 3 caisson replacement and in-water caisson seat repairs proposed under Alternative 1; therefore, impacts on surface waters would be minimal and short-term. Standard best management practices (BMPs) would be incorporated to prevent indirect impacts to water quality during upland work for both projects. Erosion control measures would be installed prior to construction, and a soil and erosion control plan would be implemented to guide appropriate placement of control measures on the site. Construction activities would comply with the Maine Erosion and Sedimentation Control Law, Maine Stormwater Management Law, and Maine Site Location of Development Law.

Alternative 2 would involve additional pile driving during in-water work at Berths 11, 12, and 13 and Dry Dock 3 (resulting from construction and removal of a temporary cofferdam) that would result in greater short-term impacts to surface water quality during construction. Under Alternative 2, the temporary cofferdam at Dry Dock 3 would occupy an estimated footprint of 7,458 square feet. If Alternative 2 is implemented, compensatory mitigation in the form of an in-lieu fee paid to the Maine DEP would be obtained prior to the start of construction for the temporary and permanent fill proposed under this alternative. Alternative 2 would require the same permits and would incorporate the same BMPs identified for Alternative 1. The No Action Alternative would not result in any changes in surface waters or surface water quality.

Architectural Resources/Historic Properties. Alternatives 1 and 2 would result in an adverse effect under Section 106 of the National Historic Preservation Act (NHPA) on Dry Dock 3 as a result of removal and replacement of the caisson and repair of the caisson seats. Dry Dock 3 is a contributing resource within the Portsmouth Naval Shipyard Historic District, and the proposed caisson replacement project would damage its character-defining features. The Navy is currently consulting with the Maine State Historic Preservation Office (SHPO), the Advisory Council for Historic Preservation (ACHP), and other interested parties regarding the finding of an adverse effect on Dry Dock 3 under Alternative 1, the Preferred Alternative, and execution of a Memorandum of Agreement (MOA) between the Navy and the Maine SHPO is anticipated. Results of this consultation will be included as they become available. Alternatives 1 and 2 would not result in adverse effects on any other architectural resources at the Shipyard that are historic properties, and direct and indirect impacts on architectural resources at the Shipyard under NEPA would be minimal to moderate. The No Action Alternative would not result in changes to architectural resources.

Marine Mammals. In-water construction activities under Alternatives 1 and 2 would generate underwater noise that would have the potential to disturb or displace small numbers of marine mammals. During in-water construction individual marine mammals may be exposed to sound pressure levels from impact/vibratory pile driving, extraction, and drilling that may result in Level B behavioral harassment under the Marine Mammal Protection Act. Any marine mammals that are taken (harassed), may change their normal behavior patterns (i.e., swimming speed, foraging habits, etc.) or be temporarily displaced from the area of construction. Any takes would likely have only a minor effect on individuals and no effect on populations. Alternative 1 would minimize construction-related impacts by constructing the bulkheads at Berths 11, 12, and 13 with drilled and grouted king piles and concrete shutter panels. The bulkheads proposed under Alternative 2 would be constructed with driven steel sheet-piles, resulting in greater temporary construction impacts. Likewise, Alternative 2 would result in greater temporary impacts as a result of construction and removal of the temporary cofferdam at Dry Dock 3.

The Navy submitted an Incidental Harassment Authorization (IHA) application to the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service for the proposed waterfront projects under Alternative 1, the Preferred Alternative, on February 10, 2016. The potential takes of marine mammals outlined in the IHA application represent the maximum expected number of marine mammals that could be exposed to acoustic sources reaching Level B harassment levels during the first year of construction. The Navy plans to submit additional IHA applications for each subsequent year of in-water construction. The Navy will employ a number of mitigation measures during each year of in-water construction in an effort to minimize the number of marine mammals potentially affected. Given the short daily duration of noise associated with individual pile driving and removal and the relatively small areas being affected, in-water noise is not expected to result in any long-term, adverse impacts to marine mammals, and no significant impacts on marine mammals are expected.

Essential Fish Habitat. Potential short-term impacts on managed species with designated essential fish habitat (EFH) would result primarily from temporary re-suspension of bottom sediments and underwater noise during dredging and pile-driving at Berths 11, 12, and 13 and underwater repairs at the Dry Dock 3 caisson. Construction activities would temporarily displace EFH species and their prey from in-water construction areas and may result in the loss of less mobile or sessile organisms. Alternative 1 would minimize construction-related impacts by constructing the bulkheads at Berths 11, 12, and 13 with drilled and grouted king piles and concrete shutter panels. The bulkheads proposed under Alternative 2 would be constructed with driven steel sheet-piles, resulting in greater temporary construction impacts. Construction of a temporary cofferdam at Dry Dock 3 under Alternative 2 also would result in greater temporary construction impacts across a larger area.

Construction of the bulkheads at Berths 11, 12, and 13 would result in the permanent loss of approximately 98,800 square feet (2.27 acres) of benthic habitat, including benthic communities designated as EFH, if the bulkhead at Berth 11C is not constructed and 118,800 square feet (2.73 acres) if the bulkhead at Berth 11C is constructed. The bulkheads would also permanently remove approximately 2.0 to 4.8 million cubic feet of open water. At Dry Dock 3, construction of the temporary cofferdam under Alternative 2 would temporarily impact an estimated 7,458 square feet of habitat, in addition to the area affected at the berths. Loss of habitat as a result of construction of the cofferdam would be temporary, since the cofferdam would be removed once construction is complete. Given the small loss of EFH and the lower Piscataqua River system's ability to return to pre-construction conditions relatively quickly, fish would not be permanently deterred from foraging or otherwise using the habitats

within the Action Areas for the Proposed Action. Based on the temporary disturbance associated with in-water construction activities, the previously disturbed nature of the Project Area and the abundance of suitable habitat near the Action Area, impacts on EFH species under either alternative would be short term and moderate. The Navy has prepared an EFH assessment and is consulting with NOAA Fisheries Service regarding the potential impacts of Alternative 1, the Preferred Alternative. The Navy, in consultation with NOAA Fisheries, will develop mitigation measures as needed to minimize impacts on EFH and managed fish species.

Threatened and Endangered Species. Based on the presence of suitable habitat and known migration routes up the Piscataqua River, two species listed under the Endangered Species Act (ESA) may occur within the Project area: the threatened Atlantic sturgeon and the endangered shortnose sturgeon. Individual sturgeon present in and near the Project area are highly mobile and would be expected to avoid active construction areas. Based on the abundance of suitable habitat within the Great Bay estuary system and lower Piscataqua River, the species' migratory nature, and the temporary disturbance associated with in-water construction activities, individual sturgeon displaced by construction are not expected to be adversely impacted. The permanent impacts from the small loss of benthic habitat under either alternative are not expected to adversely affect these species. Therefore, construction of the Proposed Action may affect, but is not likely to adversely affect, the Atlantic sturgeon or shortnose sturgeon. Impacts under Alternative 2 would be greater than those under Alternative 1 as a result of the increase in pile driving but would still be short term and minor, given the temporary nature of in-water construction activities and abundance of suitable habitat in other areas of the estuary. The Navy is consulting with NOAA Fisheries regarding these findings. The EA is serving as the Biological Assessment for the Proposed Action for the required consultation under section 7 of the ESA, and the Navy, in consultation with NOAA Fisheries Service, will develop mitigation measures as needed to minimize impacts to the Atlantic sturgeon and shortnose sturgeon.

Airborne Noise. Construction of the proposed waterfront projects under Alternative 1 and Alternative 2 would generate temporary noise due to the use of heavy construction equipment, trucks, and other vehicles. Given the temporary and intermittent nature of the proposed construction work, the impacts on nearby residential receptors during construction would be considered minor to moderate under Alternative 1 and moderate under Alternative 2 as a result of increased pile driving at Berths 11, 12, and 13 and pile driving at Dry Dock 3, closer to the nearest residential receptors. Construction would occur only during daylight hours and would comply with local noise ordinances under either alternative. Therefore, implementation of the Proposed Action under either alternative would not result in significant impacts to the noise environment during construction. Noise levels during continued operations of the berths and Dry Dock 3 would be similar to existing baseline noise levels; therefore, long-term noise impacts are not expected.

Table ES-1 provides a summary of the potential impacts on the resources associated with each of the alternative actions analyzed.

Table ES-1 Summary of Potential Impacts to Resource Areas

Resource Area	*No Action Alternative*	*Alternative 1 (Preferred Alternative)*	*Alternative 2*
Air Quality	No change in emissions. No change in the vulnerability of Shipyard waterfront infrastructure to the impacts of climate change.	Annual direct emissions of criteria pollutants during construction and after implementation would not result in significant impacts on air quality. Routine operational activities would generate a minimal annual increase in GHG emissions that would not be likely to contribute to global warming to a discernible extent. Reduced vulnerability of Shipyard waterfront infrastructure to the impacts of climate change.	Annual direct emissions of criteria pollutants during construction and after implementation would not result in significant impacts on air quality. Routine operational activities would generate a minimal annual increase in GHG emissions that would not be likely to contribute to global warming to a discernible extent. Reduced vulnerability of Shipyard waterfront infrastructure to the impacts of climate change.
Water Resources	No change in water resources.	Short-term minor impacts on surface water, wetlands, and marine sediments resulting from disturbance and potential water quality impacts during construction. No impact on the floodplain. Short-term impacts would be minimized through use of standard BMPs and compliance with applicable federal and state permits and regulations. Long-term, minor impacts on wetlands due to permanent fill of 98,800 square feet to 118,800 square feet (with Option 1) of the Piscataqua River. Compensatory mitigation for the loss of coastal habitat functions and values as a result of the proposed fill will occur in the form of an in-lieu fee paid to the Maine DEP prior to the start of construction.	Greater short-term impacts during construction as a result of additional pile driving and the construction of a temporary cofferdam under this alternative. No impact on the floodplain. Short-term impacts would be minimized through use of standard BMPs and compliance with applicable permits and regulations and would be minor. Temporary and permanent fill would impact an area of 106,258 square feet to 126,258 square feet (with Option 1) of the Piscataqua River. Compensatory mitigation for the loss of coastal habitat functions and values as a result of the proposed fill will occur in the form of an in-lieu fee paid to the Maine DEP prior to the start of construction.

Table ES-1 Summary of Potential Impacts to Resource Areas

Resource Area	*No Action Alternative*	*Alternative 1 (Preferred Alternative)*	*Alternative 2*
Bathymetry	No changes to bathymetry in the project area.	Long-term, minor impacts on bathymetry at Berths 11, 12, and 13 due to permanent removal of river bottom. The Proposed Action would not affect navigation in the Piscataqua River.	Long-term, minor impacts on bathymetry at Berths 11, 12, and 13 due to permanent removal of river bottom. Temporary and minor impacts on bathymetry at Dry Dock 3 as a result of dredging and fill during construction. The Proposed Action would not affect navigation in the Piscataqua River.
Cultural Resources	No change to existing cultural resources in the project area.	No adverse effect on archaeological resources. Replacement of the Dry Dock 3 caisson would result in an adverse effect to Dry Dock 3, a contributing resource within the Portsmouth Naval Shipyard Historic District. The Navy has determined that no other architectural resources in the Areas of Potential Effect for the waterfront improvement projects would be adversely affected. The Navy is consulting with the Maine SHPO and ACHP regarding the finding of an adverse effect, and execution of a Memorandum of Agreement is anticipated. No traditional cultural properties have been identified at the Shipyard. The Navy is consulting with federally recognized tribes regarding the Proposed Action under Alternative 1.	No adverse effect on archaeological resources. Replacement of the Dry Dock 3 caisson would result in an adverse effect to Dry Dock 3, a contributing resource within the Portsmouth Naval Shipyard Historic District. The Navy has determined that no other architectural resources in the Areas of Potential Effect for the waterfront improvement projects would be adversely affected. A separate consultation with the Maine SHPO and ACHP regarding the Dry Dock 3 caisson replacement would be required if this alternative is implemented due to the different in-water construction method. No traditional cultural properties have been identified at the Shipyard.
Biological Resources	No change to estuarine biological resources.	Minor impacts on marine vegetation, fish (including managed essential fish habitat [EFH] species), benthic habitat and species, as a result of disturbance, including from turbidity and in-water noise, and limited mortality during construction and long-term loss of benthic and open water habitat.	Impacts resulting from increased pile driving and construction of the temporary cofferdam at Dry Dock 3 would occur over a longer duration and affect a slightly larger area. Overall short- and long-term impacts would be similar to those under Alternative 1 and would be minor. A separate

Table ES-1 Summary of Potential Impacts to Resource Areas

Resource Area	*No Action Alternative*	*Alternative 1 (Preferred Alternative)*	*Alternative 2*
		In-water noise would not result in long-term adverse effects or significant impacts on marine mammals. The Navy would implement various mitigation measures to reduce the number of marine mammals potentially affected by in-water noise. Alternative 1 may affect, but is not likely to adversely affect, two species listed under the ESA, the Atlantic sturgeon and the shortnose sturgeon. The Navy is consulting with NOAA Fisheries Service on the potential effects to listed species under Alternative 1.	consultation with NOAA Fisheries Service under section 7 of the ESA would be required if Alternative 2 is implemented.
Visual Resources	No change to existing visual resources.	Minor to moderate short-term visual impacts during construction and overall minor long-term visual impacts. Short-term impacts would cease once construction is complete. No significant impacts on visual resources.	Minor to moderate short-term visual impacts during construction and overall minor long-term visual impacts. Short-term impacts would cease once construction is complete. No significant impacts on visual resources.
Noise	No change in existing ambient noise levels. Continued noise from Shipyard operations.	Temporary increase in ambient noise levels during daytime hours, and minor to moderate impacts at nearest sensitive receptors.	Temporary and intermittent increase in ambient noise levels during daytime hours, and moderate impacts at nearest sensitive receptors. Increases in ambient noise levels during construction would be greater than under Alternative 1 because of the increase in pile driving at Berths 11, 12, and 13 and construction/removal of the temporary cofferdam at Dry Dock 3.

Table ES-1 Summary of Potential Impacts to Resource Areas

Resource Area	*No Action Alternative*	*Alternative 1 (Preferred Alternative)*	*Alternative 2*
Infrastructure	No changes to existing infrastructure at the Shipyard.	Short- and long-term minor impacts on stormwater management during construction and as a result of expansion of the fitting-out pier deck. Short-term, minor impacts on solid waste management resulting from disposal of dredge spoils. No long-term changes in utility demand would result.	Short- and long-term minor impacts on stormwater management during construction and as a result of expansion of the fitting-out pier deck. Greater but still short-term, minor impacts on solid waste management resulting from disposal of dredge spoils from the berths and Dry Dock 3. No long-term changes in utility demand would result.
Transportation	No change to existing transportation conditions.	Temporary, minor increases in vehicle traffic during construction, no significant impact.	Temporary, minor increases in vehicle traffic during construction. Average peak and daily vehicle trips would be slightly higher under Alternative 2. No significant impact on transportation.
Hazardous Materials and Waste	No change associated with hazardous materials and wastes.	Negligible impacts from handling of hazardous materials, generation and management of hazardous waste and handling of materials with special hazards. Small quantities of materials and wastes would be handled. The Navy and contractors would comply with a framework of federal/state regulations and Navy procedures.	Negligible impacts from handling of hazardous materials, generation and management of hazardous waste and handling of materials with special hazards, Small quantities of materials and wastes would be handled. The Navy and contractors would comply with a framework of federal/state regulations and Navy procedures.

Environmental Assessment for Waterfront Improvement Projects at Portsmouth Naval Shipyard, Kittery, Maine

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Abbreviations and Acronyms

Acronym	Definition
AADT	Average Annual Daily Traffic
ACM	Asbestos-containing Material
AOC	Area of Concern
AOC	Area of Concern
APE	Area of Potential Effects
AST	aboveground storage tank
BMP	Best Management Practice
°C	Celsius
C&D	construction and demolition
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIA	Controlled Industrial Area
cm	centimeter
CNO	Chief of Naval Operations
CO_2e	carbon dioxide equivalent
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted decibel
DERP	Defense Environmental Restoration Program
DNL	Day-Night Average Sound Level
DoD	U.S. Department of Defense
DOT	Department of Transportation
DSP	distinct population segment
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EO	Executive Order
ER	Environmental Restoration (Program)
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FTA	Federal Transportation Agency
FY	Fiscal Year
GHG	greenhouse gas
HAP	Hazardous Air Pollutant
ICRMP	Integrated Cultural Resources Management Plan
IHA	Incidental Harassment Authorization
kV	kilovolt
LBP	lead-based paint
L_{eq}	equivalent sound level
LID	Low Impact Development
M.R.S.	Maine Revised Statutes
M.R.S.A.	Maine Revised Statutes Annotated
MEDEP	Maine Department of Environmental Protection
mm	millimeter
MMPA	Marine Mammal Protection Act
MOA	memorandum/memoranda of understanding
MPDES	Maine Pollutant Discharge Elimination System
MPIAQCR	Metropolitan Portland Intrastate Air Quality Control Region
MSAT	Mobile Source Air Toxic
MT	metric ton
MW	megawatt
MWH	megawatt-hour
NAAQS	National Ambient Air Quality Standard
NAVSEA	Naval Sea Systems Command
Navy	U.S. Department of the Navy
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act

Acronym	Definition
NIOSH	National Institute for Occupational Safety and Health
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NRPA	Natural Resources Protection Act
NWI	National Wetland Inventory
OPNAVINST	Chief of Naval Operations Instructions
OSP	Optimum Sustainable Population
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PNSY	Portsmouth Naval Shipyard
POV	Privately Owned Vehicle
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
RMS	root mean square
ROI	Region of Influence
S.R.	State Route
SEL	Sound Exposure Level
Shipyard	Portsmouth Naval Shipyard
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SPCC	Spill Prevention, Control, and Countermeasures
TL	transmission loss
tpy	tons per year
U.S.	United States
U.S.C.	U.S. Code
UFC	United Facilities Criteria
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
ZOI	zone of influence

1 Purpose of and Need for the Proposed Action

1.1 Introduction

The U.S. Department of the Navy (Navy) proposes to restore and modernize waterfront infrastructure associated with Dry Docks 1 and 3 at Portsmouth Naval Shipyard (the Shipyard) in Kittery, York County, Maine (Figure 1-1). Construction associated with the action would take place in phases between October 2016 and October 2022. This section briefly identifies the Proposed Action and the responsible agency or agencies involved, including any cooperating agencies. It provides a succinct summary of the history of events and other relevant background information leading up to the Proposed Action. It also identifies the regulatory authority under which the National Environmental Policy Act (NEPA) document is being prepared.

The Navy has prepared this Environmental Assessment (EA) in accordance with NEPA, as implemented by the Council on Environmental Quality (CEQ) Regulations and Navy regulations for implementing NEPA. The action proponent is the Commanding Officer, Portsmouth Naval Shipyard. No cooperating agencies were involved in preparation of this EA.

Existing waterfront facilities that support the missions at Dry Docks 1 and 3 have reached the end of their design lives and are not able to meet evolving Shipyard mission requirements. Continuous maintenance and repair of waterfront facilities, including the pier structure at Berths 11, 12, and 13 and the Dry Dock 3 caisson (or gate) and its concrete seats, result in excessive costs and schedule delays and, therefore, impact the Shipyard's ability to efficiently achieve its mission.

Missions of the Shipyard's Dry Docks

The Shipyard's primary mission has changed several times over its history in response to changes in the Navy fleet. The current mission of the Shipyard is the overhaul, repair, and modernization of the Navy's *Los Angeles* class submarines under Naval Sea Systems Command. This mission is expanding to the next generation of Navy submarine, the *Virginia* class, a process that began with the commissioning of the USS *New Hampshire* at the Shipyard in 2008 (U.S. Department of the Navy [Navy] 2012.).

The Shipyard's dry docks are located in the controlled industrial area (CIA), which is fenced, and access is controlled by several gates to provide security for dry dock operations. Each dry dock's mission is described below.

Dry Dock 1 – Supports Chief of Naval Operations (CNO)-mandated engineering overhauls of *Los Angeles* class submarines. During an engineering overhaul, a submarine's components are disassembled, thoroughly cleaned or replaced if worn out, and then reassembled.

Dry Dock 2 – Supports fuel servicing, maintenance, and overhaul of *Los Angeles* class submarines.

Dry Dock 3 – Supports maintenance and overhaul of *Virginia* class submarines. Dry Dock 3 is the Shipyard's premier *Virginia* class dry dock.

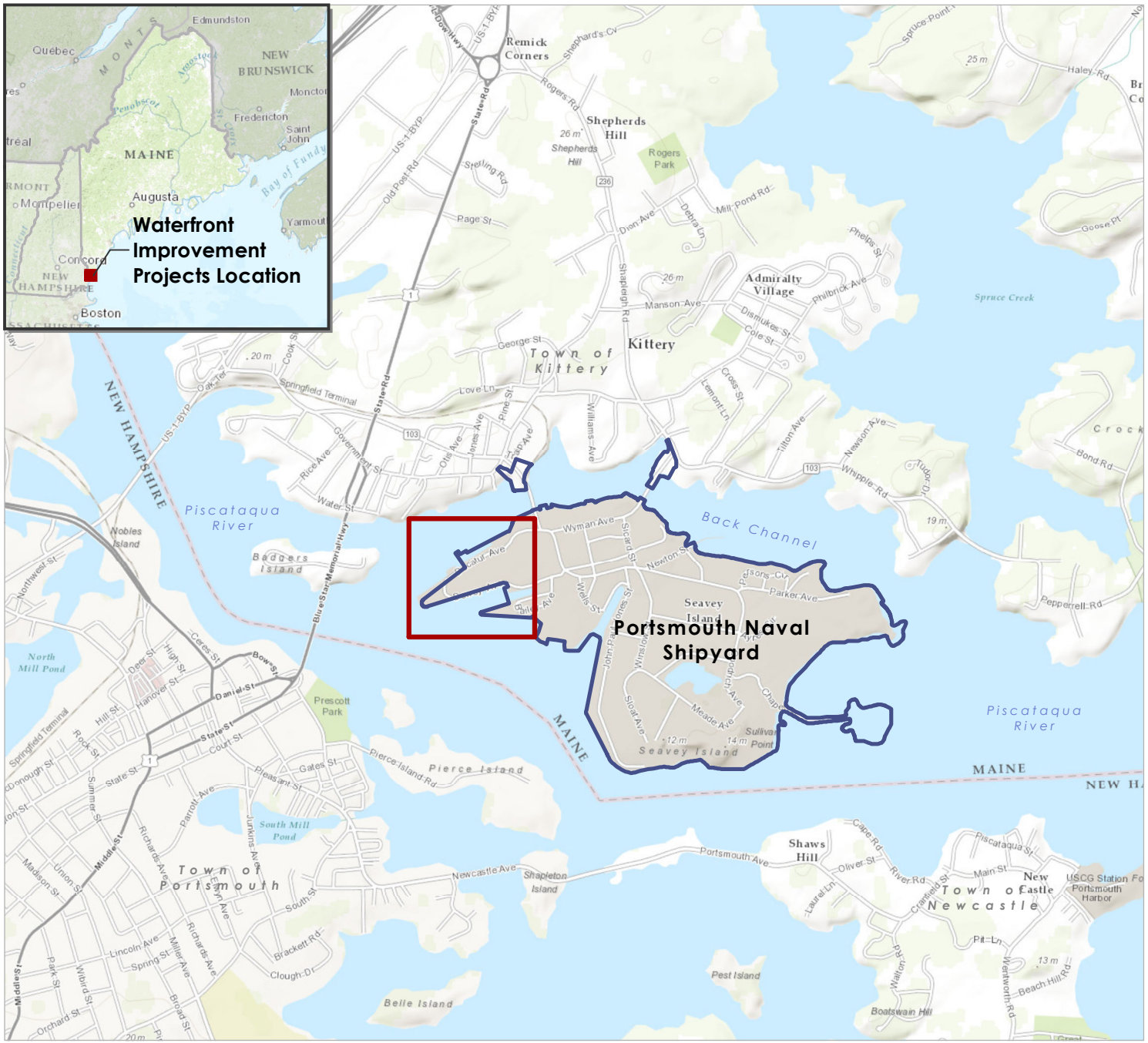

Figure 1-1
Location Map
Portsmouth Naval Shipyard
York County, Maine

Legend

Installation Area

0 1,000 2,000 3,000 4,000 Feet

Source: ESRI 2013; Department of Defense 2014.

Path: L:\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\DOPPA\Figure_1-1_Regional Map_8.5x11.mxd

Berths 11, 12, and 13. The pier infrastructure at Berths 11, 12, and 13 supports part of the west circuit of the Shipyard's portal crane rail system (see Figure 1-2). Portal cranes, which are track-mounted cranes on a central shaft atop four steel legs, are used to pre-assemble pieces of submarines, move them to a dry dock, and lift or reposition them as needed. Portal cranes also are used to lift and move large equipment (see Photo 1-1).

Age-related structural weaknesses in this pier, called the "fitting-out" pier, directly impact operation of the west circuit of the portal crane rail system—and consequently impact maintenance schedules and the associated costs of maintenance services at Dry Docks 1 and 3. The sides of the pier are open at Berths 11, 12, and 13, and water action has corroded the steel piles over the decades, weakening the overall structure that supports the portal crane rail system (see Photo 1-2). Accelerated corrosion of the piles at Berths 11, 12, and 13 has reduced and will continue to reduce the rated load-bearing capacity of these piles—or the maximum weight they can support with limited risk of failure—which in turn prevents the Shipyard's portal cranes from operating at their full 60-ton load-bearing capacity. The Shipyard has been maintaining the piles at the fitting-out pier by installing pile jackets (i.e., fabric pouches that are installed around a pile over steel reinforcing bars and then filled with mortar). However, when pile jackets are installed, the rated load-bearing capacity of the piles must be reduced because of a combination of the reduced strength of the piles and the added weight of the pile jackets. Erosion of soil from the open sides of the pier and age-related failure of the pier deck additionally affect the structural integrity of these berths.

Dry Dock 3 Caisson and Seats. The steel caisson and seats at the entrance to Dry Dock 3 form the watertight enclosure for the dry dock. The existing caisson has been in use since 1962, has reached the end of its service life, and is showing signs of deterioration. At the inner and outer caisson seats, spalled concrete (i.e., concrete that has broken, flaked, or become pitted) allows some seawater to infiltrate the dry dock. Failure of either the caisson or caisson seats would cause uncontrolled flooding of the dry dock, potentially resulting in major damage to multi-billion-dollar vessels and injuries to personnel working in the dry dock. The caisson and caisson seats may no longer meet the requirements of the Naval Sea Systems Command Safety Certification Program for dry-docking facilities if they continue to deteriorate (DoD Standard Practice 1625C[SH] [MIL-STD-1625C[SH] 1987).

Major restoration and modernization of the infrastructure described above are needed to meet operational requirements and ensure safe operating environments for employees, industrial facilities and processes, and vessels.

1.2 Location

Established in 1800, Portsmouth Naval Shipyard is one of four remaining Naval shipyards in the nation. The Shipyard is centrally located about 50 miles from Boston, Massachusetts; Portland, Maine; and Manchester, New Hampshire, at the southernmost tip of Maine. The Shipyard fully encompasses Seavey Island, which lies at the mouth of the Piscataqua River. This federally owned island lies across the harbor from Portsmouth, New Hampshire, with access to the mainland by two bridges that connect to Kittery, Maine (Figure 1-1).

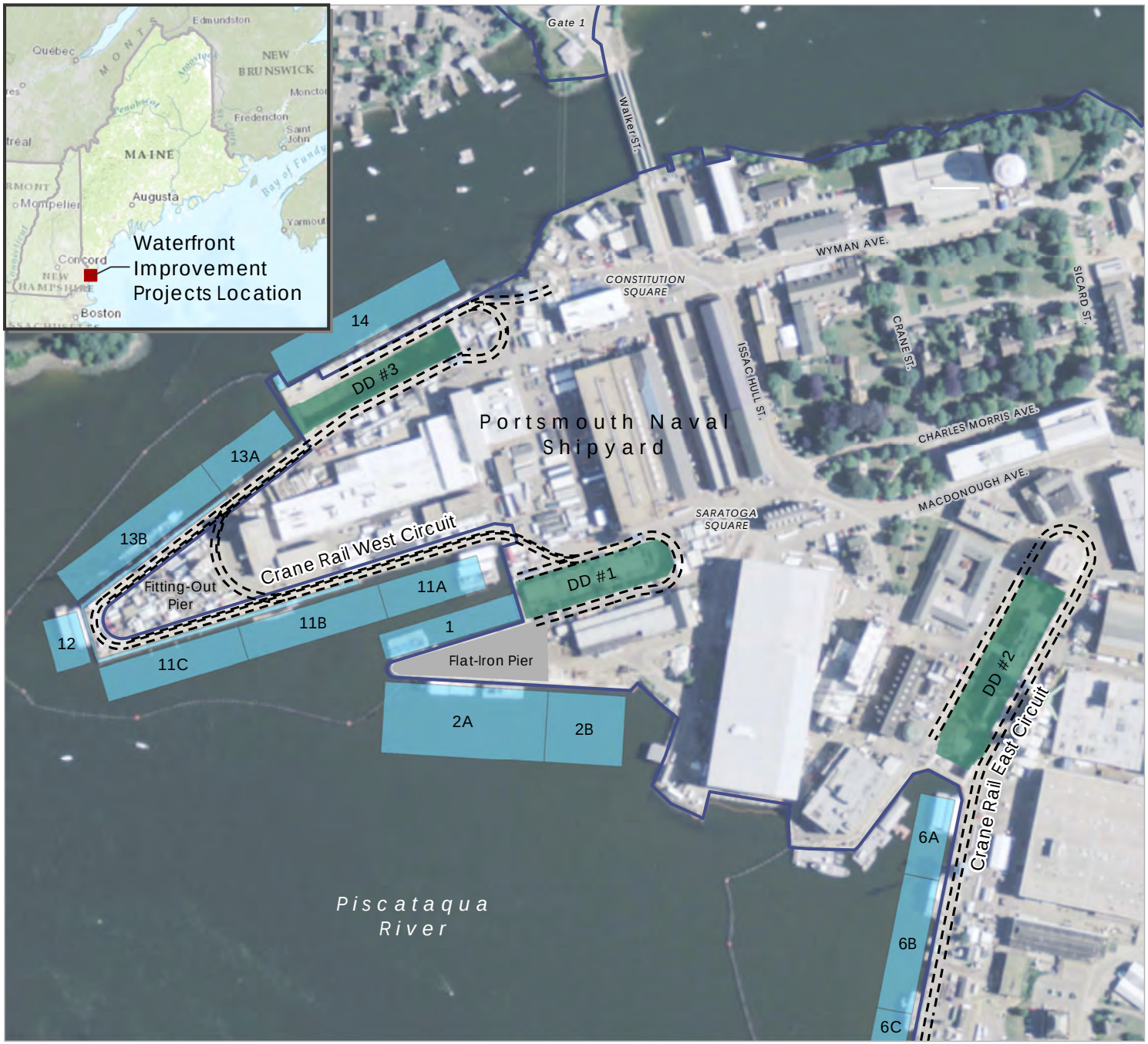

Figure 1-2
Dry Docks, Berths, and the Portal Crane Rail System
Portsmouth Naval Shipyard
York County, Maine

Legend

- Dry Dock
- Berth
- Installation Area
- Portal Crane Rail

N

0 250 500 750 Feet

Source: ESRI 2013; Department of Defense 2014.

Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\DOPPA\Figure_1-2_Dry Docks and the Portal Crane Rail System.mxd 1/25/2016

Photo 1-1 Portal Cranes

Photo 1-2 Piles at Berth 11 with Corrosion Visible near the Water Line

The Shipyard comprises more than 297 acres, including the main base and a family housing site off-base in Kittery, Maine. Many of the buildings located at the Shipyard are in an historic district, and 49 buildings are listed on the National Register of Historic Places (NRHP). The Shipyard has three dry docks and is capable of docking all active classes of submarines.

Portsmouth Naval Shipyard's primary mission is the overhaul, repair, and modernization of *Los Angeles*-class submarines. The Shipyard provides the Navy's submarine fleet with quality overhaul work in a safe, timely, and affordable manner. This includes a full spectrum of in-house support—from engineering services and production shops, to unique capabilities and facilities, to off-site support—all of which serve the multi-faceted assortment of fleet requirements.

The Proposed Action would occur in the Shipyard's controlled industrial area (CIA) and in the adjacent waters of the Piscataqua River (the Project area). The Project area is approximately 600 feet east of Badgers Island, an occupied island that is part of the Town of Kittery, and adjacent to the Piscataqua River federal navigation channel, which bisects the main channel of the river south of the Shipyard. A smaller channel, known as the Back Channel, is adjacent to the Project area to the north.

1.3 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to modernize and maximize dry dock capabilities for performing current and future missions efficiently and with maximum flexibility.

> 10 U.S.C. Section 5062: "The Navy shall be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea. It is responsible for the preparation of Naval forces necessary for the effective prosecution of war except as otherwise assigned and, in accordance with integrated joint mobilization plans, for the expansion of the peacetime components of the Navy to meet the needs of war."

The need for the Proposed Action is to correct the deficiencies noted above (see Section 1.1) and ensure that the Shipyard can continue to support its primary mission to service, maintain, and overhaul submarines. By supporting the Shipyard's mission, the Proposed Action would assist in meeting the larger need for the Navy to provide capabilities for training and equipping combat-capable Naval forces ready to deploy worldwide. In this regard, the Proposed Action furthers the Navy's execution of its congressionally mandated roles and responsibilities under 10 U.S. Code (U.S.C.) Section 5062.

1.4 Scope of Environmental Analysis

This EA includes an analysis of potential environmental impacts associated with the action alternatives and the No Action Alternative. The environmental resource areas analyzed in this EA include air quality, water resources, bathymetry, cultural resources, marine biological resources (marine vegetation, marine mammals, fish, benthic invertebrates, and marine threatened and endangered species), visual resources, airborne noise, infrastructure, transportation, and hazardous materials and waste. The study area for each resource analyzed may differ as a result of the way the Proposed Action interacts with or impacts the resource. For instance, the study area for hazardous materials and waste may only include the construction footprint of a building, whereas the noise study area would be expanded to include surrounding areas that may be impacted by airborne noise during construction.

1.5 Relevant Laws and Regulations

The Navy has prepared this EA based upon federal and state laws, statutes, regulations, and policies that are pertinent to the implementation of the Proposed Action, including the following:

- NEPA (42 U.S.C. sections 4321-4370h), which requires an environmental analysis for major federal actions that have the potential to significantly impact the quality of the human environment
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] parts 1500-1508)
- Navy regulations for implementing NEPA (32 CFR part 775), which provides Navy policy for implementing CEQ regulations and NEPA
- Clean Air Act (CAA) (42 U.S.C. Section 7401 et seq.)
- Clean Water Act (CWA) (33 U.S.C. Section 1251 et seq.)
- Rivers and Harbors Act (33 U.S.C. Section 403 et seq.)
- Coastal Zone Management Act (CZMA) (16 U.S.C. Section 1451 et seq.)
- National Historic Preservation Act (NHPA)(54 U.S.C. Section 306108 et seq.)
- Endangered Species Act (ESA) (16 U.S.C. Section 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (16 U.S.C. Section 1801 et seq.)
- Marine Mammal Protection Act (MMPA)(16 U.S.C. Section 1361 et seq.)
- Executive Order (EO) 11988, Floodplain Management
- EO 12088, Federal Compliance with Pollution Control Standards
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks
- EO 13175, Consultation and Coordination with Indian Tribal Governments
- EO 13653, Preparing the United States for the Impacts of Climate Change
- EO 13693, Planning for Federal Sustainability in the Next Decade
- Maine Natural Resources Protection Act (38 Maine Revised Statutes [M.R.S.] sections 480-A to 480-BB)
- Maine Site Location of Development Act (38 M.R.S. Section 481)
- Maine Erosion and Sedimentation Control Law (38 M.R.S. Section 420-C)

A description of the Proposed Action's consistency with these laws, policies, and regulations, as well as the names of regulatory agencies responsible for their implementation, is presented in Chapter 6 (Table 6-1).

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2 Proposed Action and Alternatives

2.1 Proposed Action

The Navy proposes to restore and modernize waterfront infrastructure associated with Dry Docks 1 and 3 at the Shipyard. The Proposed Action would include two waterfront improvement projects, which are described in detail in this chapter and in Appendix A—structural repairs to Berths 11, 12, and 13 and replacement of the Dry Dock 3 caisson. The waterfront improvement projects would be constructed between October 2016 and October 2022. (Note: Because of mission requirements and operational schedules at the dry docks and berths, the general construction schedules described for each alternative are subject to change.)

2.2 Screening Factors

The NEPA's implementing regulations provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. Only those alternatives determined to be reasonable and meet the purpose and need require detailed analysis.

Potential alternatives that meet the purpose and need were evaluated against the following screening factors:

- Preventing further loss of portal crane rail load-bearing capacity at Berths 11, 12, and 13
- Providing adequate corrosion protection at Berths 11, 12, and 13
- Restoring load-bearing capacity at Berths 11, 12, and 13 sufficient to support a minimum 78,000-pound (39-ton) operational wheel-load capacity
- Restoring the condition of the Dry Dock 3 caisson so that it meets the requirements of the Naval Sea Systems Command (NAVSEA) Safety Certification Program
- Allowing for in-water and upland construction work to occur during times that would not conflict with Shipyard mission schedules
- Reducing the Navy's total cost of ownership, i.e., the frequency and cost of maintenance work on waterfront infrastructure
- Improving operational efficiencies in and around Dry Docks 1 and 3.

2.3 Alternatives Carried Forward for Analysis

Two action alternatives were identified, based on reasonable alternative screening factors and the ability to meet the purpose and need for the Proposed Action, and are analyzed within this EA. Alternative 1, the Preferred Alternative, incorporates in-water construction techniques at Berths 11, 12, and 13 and the Dry Dock 3 caisson, which would require less pile driving, reducing impacts on in-water resources, including marine mammals, fish, and benthic communities, and reducing airborne noise impacts on communities near the Shipyard. Alternative 2 incorporates different in-water construction techniques at Berths 11, 12, and 13 and the Dry Dock 3 caisson and would require a larger number of piles and thus more pile driving than Alternative 1. While the alternatives described below have been developed based on general construction methodologies, the exact means and methods of construction would be determined at the discretion of the construction contractor.

2.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. The infrastructure and operational deficiencies described in Chapter 1 would not be addressed, with serious consequences to the Shipyard's ability to meet mission requirements. Failure to implement the Proposed Action would prevent the Shipyard from offering competitive and timely repair, maintenance, and overhaul services to the Navy fleet. Because it would fail to support mission requirements, the No Action Alternative would not meet the purpose and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis in this EA and provides a baseline for measuring the environmental consequences of the action alternatives.

2.3.2 Alternative 1 (Preferred Alternative)

Table 2-1 provides the estimated construction schedules for the Berths 11, 12, and 13 structural repairs and Dry Dock 3 caisson replacement under Alternative 1. Because of mission requirements and operational schedules at the dry docks and berths, these schedules are subject to change.

Table 2-1 Construction Timeframes for the Proposed Waterfront Improvement Projects, Alternative 1[1]

Project	*Estimated Construction Start*	*Estimated Construction End*
Berths 11, 12, and 13 Structural Repairs	October 2016	October 2022
Phase 1	October 2016	June 2019
In-Water Work - Phase 1 (Berth 11)	January 2017	August 2018
Phase 2	October 2020	October 2022
In-Water Work - Phase 2 (Berths 12 and 13)[2]	To be determined based on availability of berths	To be determined based on availability of berths
Dry Dock 3 Caisson Replacement	February 2017	August 2018
In-Water Work – Outer Caisson Seat Repairs	March 2017	July 2017

Note:
1 Due to mission requirements and operational schedules at the dry docks and berths, the general construction schedules above are subject to change.
2 In-water work at Berths 12 and 13(A and B) would be completed in phases, subject to operational schedules at these berths. The total duration of in-water work at both berths would be between 18 and 20 months.

Berths 11, 12, and 13 Structural Repairs

This proposed project would protect the pier structure at Berths 11, 12, and 13 from further deterioration and restore portal crane load-bearing capacity by enclosing these berths with bulkheads. The project would involve in-water work when installing the bulkheads and upland work when demolishing the existing timber pier deck along the berths, relocating utilities, and restoring and expanding the concrete and timber pier deck once construction is complete.

Construction of this project would be phased to avoid causing operational impacts at Dry Docks 1 and 3. Phase 1 of construction at Berth 11 would begin no earlier than October 2016 (in-water work would begin no earlier than January 2017) and would be completed by June 2019. Phase 2 of construction at Berths 12 and 13 would begin no earlier than October 2020 (in-water work to be determined based on availability of berths) and be completed by October 2022. Construction schedules are subject to change due to mission requirements.

Under Alternative 1, the Preferred Alternative, Berths 11 (A and B), 12, and 13 (A and B) would be enclosed with bulkheads constructed primarily of steel H-type king piles and concrete shutter panels (pre-cast concrete panels that would be stacked on top of one another to form a wall). The approximate lengths of the proposed bulkheads are provided in Table 2-2. The bulkheads would be constructed within approximately 5 feet of the faces of Berths 11B (and 11C under Option 1, discussed below), 12, and 13 (see Figures 2-1 and 2-2). Berth 11A is not completely linear, and the easternmost 425 feet of Berth 11A is offset from the remainder of the berth face. To align the eastern section of Berth 11A with the rest of the berth, the new bulkhead will be offset nearly 14.5 feet from the existing berth face in this area. The bulkhead at Berth 11B will be flush with the bulkhead constructed at Berth 11A.

Table 2-2 Lengths of Bulkheads under Alternatives 1 and 2[1]

Alternative	*Berth*	*Length (Feet)*
1 and 2	11A and 11B	867
1 and 2, with Option 1	11C	400
1 and 2, with Option 1	11 (A, B, and C)	1,267
1 and 2	12	180
1 and 2	13 (A and B)	790

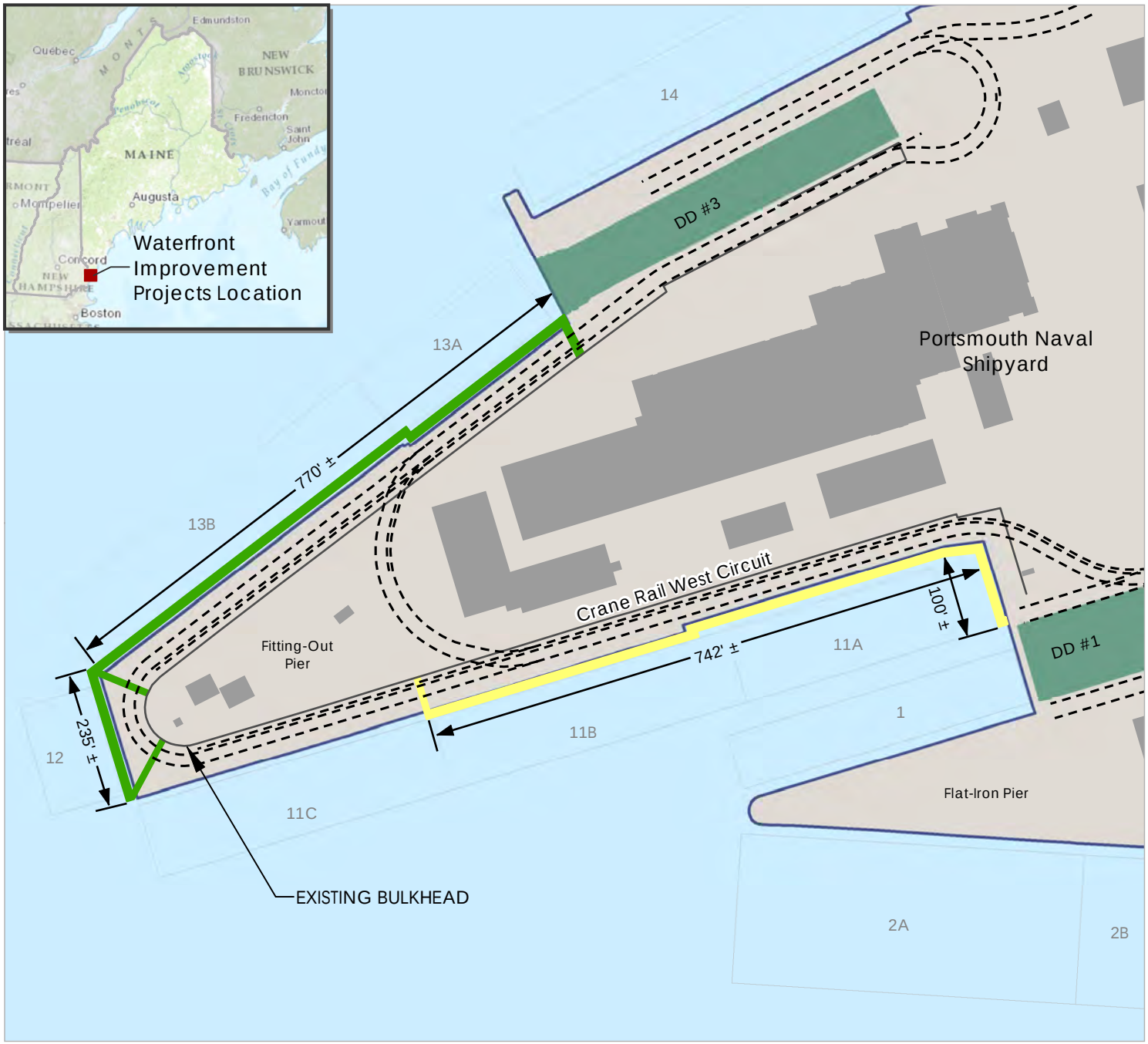
Note:
[1] Lengths are approximate.

At the beginning of the in-water work, existing timber piles would be removed from the berth faces. A total of 193 timber piles would be removed under both phases, 173 piles from Berths 11, 12, and 13 and 20 piles from two timber dolphins at the western corners of the pier (see Appendix A for more detailed information). King piles would be regularly spaced along the berths and grouted into sockets drilled into the bedrock (i.e., “rock-socketed”). The concrete shutter panels then would be installed in stacks between the king piles. The depth to bedrock is greater along an approximately 16-foot section at the eastern end of Berth 11A and an additional 101 feet between Berths 11A and 11B, thus allowing a conventional sheet-pile bulkhead to be constructed (MN-FST, 2015a). The steel sheet piles would be driven to bedrock using a vibratory hammer. Sheet piles installed with a vibratory hammer also would be used to construct “returns,” which would be shorter bulkheads connecting the new bulkheads to the existing bulkhead under the pier. Once the bulkheads are complete, the two timber dolphins at the western corners of the pier would be replaced with similar dolphins constructed of approximately 20 piles.

The Navy has determined that installing a bulkhead at Berth 11C may not be economically feasible at this time. As such, installation of a bulkhead at Berth 11C is being considered as an option under Alternative 1 that may be implemented if funding becomes available. This option is discussed in more detail below.

Additional in-water work would be required to install steel H-type sister piles at the location of the inboard portal crane rail beam at Berths 11 and 13, including Berth 11C (see Figure 2-2). The sister piles would provide additional support for the portal crane rail system and restore its load-bearing capacity. The sister piles would be driven into the bedrock below the pier, in water generally less than 10 feet deep, using an impact hammer.

Table 2-3 provides the approximate number of piles that would be installed at each berth and the installation methods that would be used for each type of pile.



Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\DOPPA\Figure_2-1_Bulkhead, Phases 1 and 2.mxd 1/25/2016

Figure 2-1
Berths 11, 12, and 13 Bulkhead,
Phases 1 and 2
Portsmouth Naval Shipyard
York County, Maine

Legend

- Proposed Bulkhead Phase 1
- Proposed Bulkhead Phase 2
- Dry Dock
- Berth
- Existing Structures
- Installation Area
- Portal Crane Rail

N

0 100 200 300 400 Feet

Source: ESRI 2013; Department of Defense 2014.

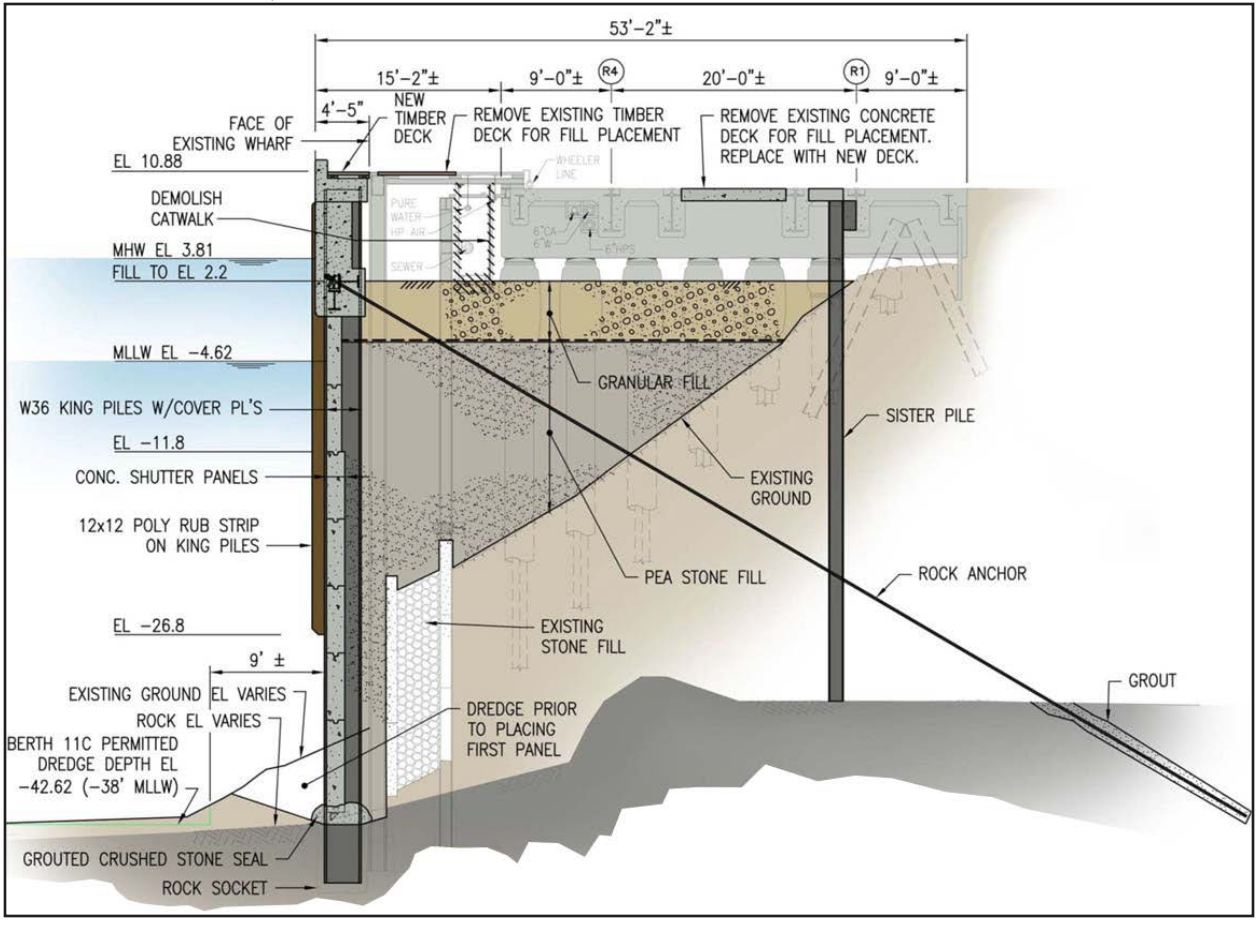


Figure 2-2
Berth 11 Bulkhead Conceptual Design
Portsmouth Naval Shipyard
York County, Maine

Table 2-3 Numbers of Piles under Alternative 1, King Pile and Concrete Shutter Panel Bulkheads[1]

Berth	*Alternative 1*			*Alternative 1 (with Option 1)*		
	11	*12*	*13*	*11*	*12*	*13*
King Piles (Rock-socketed)	60	16	67	94	16	67
Sheet Piles (Vibratory Driven)	69	0	0	69	0	0
Sheet Pile Returns (Vibratory Driven)	43	86[2]	43	43	43[3]	43
Sister Piles (Impact Driven)	50	0	37	50	0	37

Source: MN-FST 2015a

Notes:
1 Pile numbers are approximate.
2 Up to approximately 86 sheet piles may be required for the returns at Berth 12 if construction of the bulkheads at Berths 12 and 13 does not occur simultaneously. Approximately half this number of piles (43 piles) would be required to construct a return at the southern end of Berth 12, where this berth meets Berth 11.
3 Up to approximately 43 sheet piles would be required to construct a return at the northern end of Berth 12 if construction of the bulkheads at Berths 12 and 13 does not occur simultaneously.

Once the bulkheads constructed under each phase are connected to the pier at both ends and closed off, the areas inside the bulkheads and beneath the pier would be backfilled. Backfilling the bulkheads would provide several benefits, including:

- Slowing down the rate at which the piles supporting the pier are corroded by creating a reduced-oxygen environment
- Protecting the piles from water action and the splash zone
- Laterally supporting the piles along most of their height (MN-FST, 2015a).

Approximately 1,142,000 cubic feet (42,000 cubic yards) of fill would be needed to complete Phases 1 and 2 under Alternative 1. An area of approximately 98,800 square feet would be filled. Use of sediment dredged from the river bottom during construction as fill material would reduce the amount of fill material that would need to be brought onto the Shipyard under Alternative 1 to approximately 1,027,000 cubic feet (38,000 cubic yards), 90 percent of the total amount of fill (MN-FST, 2015a). Additional information on the dredging and backfill that would be required is provided in Appendix A.

The king pile and concrete shutter panel bulkheads proposed under Alternative 1, once complete, would enclose and laterally support the piles; protect the pier's utility systems; prevent additional corrosion of the piles and thereby eliminate the expensive, accelerated maintenance cycle; and restore the portal crane rail system's load-bearing capacity.

Option 1, Installation of a Bulkhead at Berth 11C

If sufficient construction funds are available, the Navy may install a king pile and concrete shutter panel bulkhead at Berth 11C as part of Phase 1 (see Figure 2-3). The bulkhead would extend from the western

end of Berth 11B to the southern end of Berth 12. The total length of the bulkhead at Berths 11A, 11B, and 11C would be approximately 1,267 feet if Option 1 is implemented (see Table 2-1). The in-water construction process would be the same as the process described above and in Appendix A. Table 2-2 provides the approximate number of piles that would be installed at Berths 11, 12, and 13 under Alternative 1 with Option 1.

A total of approximately 1,405,000 cubic feet (52,000 cubic yards) of fill would be needed if Option 1 is implemented, and an area of approximately 118,800 square feet would be filled. Using dredged material would reduce the amount of fill that would need to be brought onto the Shipyard to approximately 1,163,000 cubic feet (43,000 cubic yards). The approximate amount of fill needed at each berth is provided in Appendix A.

Dry Dock 3 Caisson Replacement

The Navy is proposing to replace the steel caisson at Dry Dock 3 to address the deterioration of the existing caisson and meet the requirements of the NAVSEA Safety Certification Program. This work would include removal and replacement of the caisson and repair of the inner and outer concrete and steel caisson seats. This project would be completed between February 2017 and August 2018; in-water work would begin no earlier than March 2017 and would be complete by July 2017. Replacement of the caisson and repair of the inner and outer concrete caisson seats would be scheduled around the operational schedule for Dry Dock 3; the construction schedule may change due to mission requirements.

Generally, construction work would begin with repairs to the outer caisson seat. Site investigations have determined that the repairs needed along the outer caisson seat are less extensive than the repairs needed along the inner seat. These repairs would consist of rehabilitating areas of cracked and spalled concrete along the outer caisson seat. Full replacement of the caisson seat would not be needed so the work would be completed underwater by divers. A temporary construction caisson also would be used to complete some of the in-water work. The temporary construction caisson will be a steel structure attached to the outside of the outer caisson seat. During work on the outer caisson seat, a containment boom and siltation curtain would be installed outside the in-water work area to contain any debris. Divers would clean the surfaces of the concrete caisson seat and steel armoring with a 10,000 psi (pounds per square inch) hydroblast pressure washer to remove any marine growth. The divers would then remove any loose, deteriorated concrete to prepare the surfaces for concrete repairs. Grout would be injected into isolated cracks in the caisson seat, and new concrete would be placed in larger areas of deterioration using the tremie concrete placement method.[1]

When operational schedules permit, the caisson would be moved from the inner caisson seat to the outer caisson seat, and repairs to the inner caisson seat would be completed. The caisson would be closed and positioned in the outer caisson seat during these repairs. Damaged concrete at the inner caisson seat would be demolished and removed. New reinforced concrete panels would be installed along the floor and walls of the dry dock, and steel armoring at the corners of the inner caisson seat would be repaired or replaced as needed.

[1] The tremie concrete placement method involves placing the end of a pipe below water and feeding concrete down the pipe. The end of the pipe is kept immersed in the fresh concrete being laid, which displaces the water from the area while preventing water from diluting the cement.

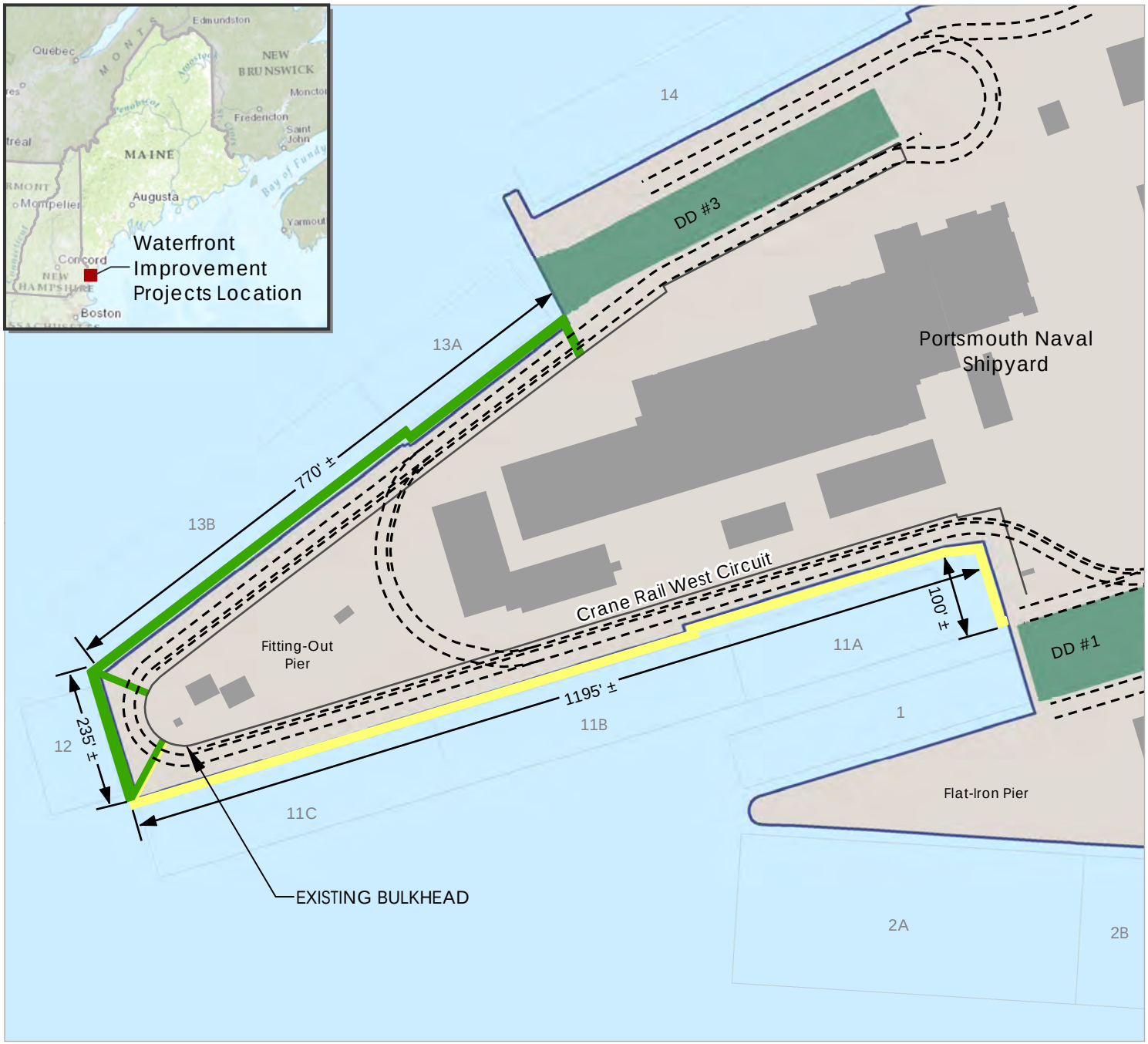


Figure 2-3
Berths 11, 12, and 13 Bulkhead with Option 1, Phases 1 and 2
Portsmouth Naval Shipyard
York County, Maine

Legend

- Proposed Bulkhead Phase 1
- Proposed Bulkhead Phase 2
- Dry Dock
- Berth
- Existing Structures
- Installation Area
- Portal Crane Rail

N

0 100 200 300 400 Feet

Source: ESRI 2013; Department of Defense 2014.

Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\DOPPA\Figure_2-3_Bulkhead Option 1, Phases 1 and 2.mxd 1/25/2016

Once repairs to the caisson seats are complete, the existing caisson would be removed and the new caisson would be floated into place and tested for water-tightness. The design of the new caisson and repaired caisson seats would take into consideration the projected sea level rise in the lower Piscataqua River. The existing caisson, once removed, would be treated in a manner determined in consultation with the Maine State Historic Preservation Office.

2.3.3 Alternative 2

Table 2-4 provides the estimated construction schedules for Berths 11, 12, and 13 structural repairs and Dry Dock 3 caisson replacement under Alternative 1. Due to mission requirements and operational schedules at the dry docks and berths, these schedules are subject to change.

Table 2-4 Construction Timeframes for the Proposed Waterfront Improvement Projects, Alternative 2[1]

Project	*Estimated Construction Start*	*Estimated Construction End*
Berths 11, 12, and 13 Structural Repairs	October 2016	October 2022
Phase 1	October 2016	June 2019
In-Water Work - Phase 1 (Berth 11)	January 2017	August 2018
Phase 2	October 2020	October 2022
In-Water Work - Phase 2 (Berths 12 and 13)[2]	To be determined based on availability of berths	To be determined based on availability of berths
Dry Dock 3 Caisson Replacement	February 2017	August 2018
In-Water Work – Cofferdam Construction	July 2017	November 2017
In-Water Work – Cofferdam Removal	March 2018	July 2018

Note:
[1] Due to mission requirements and operational schedules at the dry docks and berths, the general construction schedules above are subject to change.
[2] In-water work at Berths 12 and 13(A and B) would be completed in phases, subject to operational schedules at these berths. The total duration of in-water work at both berths would be between 18 and 20 months.

Berths 11, 12, and 13 Structural Repairs

The scope of this project would be the same as described in Section 2.3.2, and construction would be completed in the same phases. The pier structure at Berths 11, 12, and 13 would be protected from further deterioration, and portal crane load-bearing capacity would be restored through construction of bulkheads around the berths. The approximate lengths of the bulkheads are provided in Table 2-1. The bulkheads would be placed within approximately 5 feet of the faces of the existing berths, except along the eastern 425 feet of Berth 11A, which would be offset nearly 14.5 feet from the existing berth face, as described in Section 2.3.2. The project would involve in-water work to install the bulkheads and upland work to demolish the existing timber pier deck along the berths, relocate utilities, and restore and expand the concrete and timber pier deck once construction is complete.

Alternative 2 differs from Alternative 1 in the in-water construction method proposed. The steel sheet-pile bulkheads proposed under Alternative 2 would require additional pile driving and, therefore, would have greater impacts on in-water resources, including marine mammals and fish, than Alternative 1.

Under Alternative 2, Berths 11 (A and B), 12, and 13 (A and B) would be enclosed with bulkheads constructed of steel H-type king piles and steel sheet-piles (see Figure 2-2). At the beginning of in-water

work, timber piles would be removed from the berth faces as noted under Alternative 1. The king piles would be rock-socketed as described under Alternative 1. The steel sheet-piles would be driven to bedrock between the H-type king piles using a vibratory hammer. Steel sheet-pile returns would be installed with a vibratory hammer between the new bulkheads and the existing bulkhead under the pier. Once the bulkheads are complete, the two timber dolphins at the western corners of the pier would be replaced with similar dolphins constructed of approximately 20 piles.

Sister piles would be installed with an impact hammer at the inboard rail beam along the full length of Berths 11 and 13 to restore the portal crane load-bearing capacity. To maximize use of construction funds, the Navy would not install a bulkhead at Berth 11C but would install sister piles at the inboard portal crane rail beam at this berth to restore the portal crane load-bearing capacity.

Table 2-5 provides the approximate number of piles that would be installed at each berth under Alternative 2 and the installation methods that would be used for each type of pile.

Table 2-5 Numbers of Piles under Alternative 2, King Pile and Sheet Pile Bulkheads[1]

Berth	***Alternative 2***			***Alternative 2 (with Option 1)***		
	11	***12***	***13***	***11***	***12***	***13***
King Piles (Rock-socketed)	176	35	160	240	35	160
Sheet Piles (Vibratory Driven)	350	68	318	478	68	318
Sheet Pile Returns (Vibratory Driven)	43	86[2]	43	43	43[3]	43
Sister Piles (Impact Driven)	50	0	37	50	0	37

Notes:

1 Pile numbers are approximate.

2 Up to approximately 86 sheet piles may be required for the returns at Berth 12 if construction of the bulkheads at Berths 12 and 13 does not occur simultaneously. Approximately half this number of piles (43 piles) would be required to construct a return at the southern end of Berth 12, where this berth meets Berth 11.

3 Up to approximately 43 sheet piles would be required to construct a return at the northern end of Berth 12 if construction of the bulkheads at Berths 12 and 13 does not occur simultaneously.

Once the bulkheads are connected to the pier at both ends and closed off, the areas inside the bulkheads and beneath the pier would be filled. An area of approximately 98,800 square feet would be filled, and a total of approximately 1,142,000 cubic feet (42,300 cubic yards) of fill material would be needed for Alternative 2, the same estimated amount of fill as that needed under Alternative 1. Using dredged sediment would reduce the amount of fill material that would need to be brought onto the Shipyard to approximately 1,027,000 cubic feet (38,000 cubic yards), 90 percent of the total amount of fill (MN-FST, 2015a). Additional information on the dredging and backfill that would be required is provided in Appendix A.

Once complete, the bulkheads would enclose and laterally support the piles, protect the pier's utility systems, prevent additional corrosion of the piles and thereby eliminate the expensive 10-year maintenance cycle, and restore the portal crane rail system's load-bearing capacity.

Option 1, Installation of a Bulkhead at Berth 11C

If sufficient construction funds are available, the Navy may install a king pile and sheet pile bulkhead at Berth 11C as part of Phase 1 (see Figure 2-3). The bulkhead would extend from the western end of Berth 11B to the southern end of Berth 12. The total length of the bulkhead at Berths 11A, 11B, and 11C would be approximately 1,267 feet if Option 1 is implemented (see Table 2-2). The in-water construction process would be the same as the process described above and in Appendix A. Table 2-5 provides the approximate number of piles that would be installed at Berths 11, 12, and 13 under Alternative 2 with Option 1.

If Option 1 is implemented, approximately 1,405,000 cubic feet (52,000 cubic yards) of fill material would be needed, and an area of approximately 118,800 square feet would be filled. Using dredged material would reduce the amount of fill that would need to be brought onto the Shipyard to approximately 1,163,000 cubic feet (43,000 cubic yards). The approximate amount of fill needed at each berth is provided in Appendix A.

Table 2-6 provides a comparison of the approximate total number of piles that would be installed at each berth under Alternatives 1 and 2.

Table 2-6 Total Numbers of Piles under Alternatives 1 and 2[1]

Alternative	*1*	*1 (with Option 1)*	*2*	*2 (with Option 1)*
King Piles (Rock-socketed)	143	177	371	435
Sheet Piles (Vibratory Driven)	69	69	736	864
Sheet Pile Returns (Vibratory Driven)	172	129	172	129
Sister Piles (Driven)	87	87	87	87

Sources: MN-FST, 2015a

Notes:
1 Pile numbers are approximate.

Dry Dock 3 Caisson Replacement

As noted in Section 2.2.1, this project would include removal and replacement of the Dry Dock 3 caisson and repair of the inner and outer caisson seats. The caisson replacement project is expected to begin in February 2017 and be complete by August 2018; however, the construction schedule is subject to change based on mission requirements. Under Alternative 2, more extensive repairs would be completed to the outer caisson seat. The level of repairs proposed under this alternative would require construction of a temporary, circular cellular cofferdam around the entrance to Dry Dock 3 to create a dry work area. More extensive repair and replacement of the concrete panels making up the outer caisson seat would extend the operational life of the repairs to approximately 50 years, compared with an operational life of approximately 10 years if Alternative 1 is implemented. However, Alternative 2 is

more likely to disrupt waterfront industrial operations because of the increased time required to construct and remove the cofferdam. This alternative would also have additional impacts on estuarine resources as a result of temporary habitat disruption and underwater noise and would be more expensive to implement. Therefore, the underwater construction techniques described under Alternative 1 are preferred.

The general construction method for the temporary, circular cellular cofferdam proposed under Alternative 2 is described in Appendix A. Construction of the temporary cofferdam would occur at different times during the in-water work period and is anticipated to begin in July 2017 and be complete by November 2017. In-water construction would be phased to allow vessels to dock and undock at Dry Dock 3 while work is occurring on the temporary cofferdam and caisson seats. During construction of the temporary cofferdam, a containment boom and siltation curtain would be installed outside the in-water work area.

Repair work on the inner caisson seat would progress while the temporary cofferdam is still under construction. This work would occur while the existing caisson is closed, providing a dry work environment within the dry dock. Once the temporary cofferdam is completed, the Navy would complete repair work on the outer caisson seat and remove and replace the caisson. The temporary cofferdam would be removed between March 2018 and July 2018 once the caisson is replaced and the repair work on the caisson seats is completed. The entire in-water work period is expected to last approximately 12 months, beginning in July 2017 and ending no later than July 2018. The design of the new caisson and repaired caisson seats would take into consideration the projected sea level rise in the lower Piscataqua River. The existing caisson, once removed, would be treated in a manner determined in consultation with the Maine State Historic Preservation Office.

2.4 Alternatives Considered but not Carried Forward for Detailed Analysis

The following alternatives were considered but not carried forward for detailed analysis in this EA because they did not meet the purpose and need for the Proposed Action and satisfy the reasonable alternative screening factors presented in Section 2.2.

2.4.1 Repair or Replacement of the Existing Piles and Elevated Decks at Berths 11, 12, and 13

The Navy considered two additional alternatives for the Berths 11, 12, and 13 structural repairs: repairing the existing piles and elevated decks at the berths or replacing these with new piles and decks (MN-FST, 2015a). Repairing the existing timber piles at the berths would require installing concrete-encased steel H-type sister piles, which would be driven into the bedrock below the pier. Replacing the structure at each berth would require removing the existing piles, demolishing the decks, and constructing new elevated berth structures. Both of these alternatives would leave the faces of the berths open, exposing the support piles to additional deterioration over time (MN-FST, 2015a). Both alternatives were considered unfeasible and, therefore, eliminated from further consideration because the Navy would not be able to complete construction during the windows of availability when the berths are not being used for Shipyard operations.

2.4.2 Restoration of the Existing Dry Dock 3 Caisson

The Navy considered restoring the existing, historic Dry Dock 3 caisson. However, restoring the caisson to the degree that it would meet the requirements of the NAVSEA Safety Certification Program would require adding a large amount of steel to the caisson and would still result in an adverse effect on this

historic resource. Because of this expected adverse effect and the inefficiency of restoration compared with a one-for-one replacement, this alternative was eliminated from detailed consideration.

2.4.3 Construction of a Temporary Straight Steel Sheet-Pile Cofferdam at Dry Dock 3

The Navy considered constructing a temporary straight steel sheet-pile cofferdam rather than a circular, cellular cofferdam in order to replace the Dry Dock 3 caisson. Construction of a straight steel sheet-pile cofferdam would have involved driving king piles at regular intervals along the cofferdam footprint using an impact hammer after dredging the footprint. Temporary bracing frames would have been erected on the king piles and steel sheet-piles placed around the frame between the king piles and driven using a vibratory hammer. The straight steel sheet-pile cofferdam would have required that bracing frames be installed on the interior sides of the sheet piling, which would have interfered with work necessary to complete the Dry Dock 3 caisson. In addition, cellular cofferdams are structurally stronger than straight steel sheet-pile cofferdams across larger areas because each cell is self-supporting and partially filled with temporary fill material, which provides greater stability. Therefore, the alternative of a straight steel sheet-pile cofferdam was considered unfeasible and was eliminated.

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3 Affected Environment

This chapter presents a description of the environmental resources and baseline conditions that could be affected from implementing either of the alternatives.

All potentially relevant environmental resource areas were initially considered for analysis in this Environmental Assessment (EA). In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ), and 32 Code of Federal Regulations (CFR) part 775 guidelines, the discussion of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to impacts. Additionally, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact. This chapter discusses air quality, water resources, bathymetry, cultural resources, biological resources (estuarine), visual resources, noise, infrastructure, transportation, and hazardous materials and waste.

The potential impacts on the following resource areas are considered to be negligible or non-existent, so they were not analyzed in detail in this EA:

Groundwater: The Proposed Action would cause no direct impacts on groundwater resources because no ground disturbance would be needed in the Project area. The proposed action may result in indirect impacts on groundwater resources in the vicinity of the Project area as a result of temporary water quality impacts during in-water construction if contaminants inadvertently released into surface waters during construction are transported into groundwater.

Construction activities would be conducted in accordance with the Shipyard's Spill Prevention, Control, and Countermeasure (SPCC) Plan to prevent and control spills of oils. Immediate clean-up of any spills that occur during construction would prevent oils or other hazardous substances from entering groundwater. Therefore, the Proposed Action is not likely to result in groundwater impacts. No significant impacts on groundwater would result.

Topography: The topography of the region surrounding the Shipyard is characteristic of the coastal plain, which is generally flat along the shoreline and rises upward to small hills and ridges farther inland. The Shipyard is almost entirely flat, with elevations being just above sea level (Navy, 2013b). The upland Project area is flat and paved and consists of made land (fill). The Proposed Action would require filling the partially submerged area below the elevated fitting-out pier, which would not alter the topography in this location. The Proposed Action would not require additional fill or excavation in the upland Project area. Therefore, the Proposed Action would have no impacts on topography.

Geology and Soils: Surficial geology, including soils, in the upland Project area consists of man-made and natural fill materials (e.g., natural materials, dredge spoils, and construction debris), which were used in land-making activities on the Shipyard. These materials are concentrated on the west side of the Shipyard and between Jamaica and Seavey Islands (Navy, 2013a). The Proposed Action may result in temporary disturbance of soils in localized areas along Berths 11, 12, and 13 where the pier deck would be removed during construction. However, because these soils consist of artificial fill material, are currently covered with impervious surface, and have been previously disturbed, the Proposed Action would not result in substantial changes to the condition of these soils. Any soil disturbance would be conducted in accordance with the requirements of the Shipyard's Maine Pollutant Discharge Elimination System (MPDES) permit and Maine's Erosion and Sedimentation Control Law. Continued operation of the berths would not expose or otherwise impact soils in the Project area.

Construction contractors would be required to use clean fill material for structural repairs at Berths 11, 12, and 13. This fill would consist of dredge spoils, retained excavated soils, or clean fill from a company that provides this material from an approved borrow site. No new geologic resources from undeveloped sites would be developed for the Proposed Action, and existing made land in the upland Project area would not be affected. Therefore, there would be no impacts on soils or geology.

Biological Resources (Terrestrial): The upland Project area is an entirely paved, industrial area that experiences frequent human and vehicle traffic. The Project area does not contain any vegetation or suitable terrestrial wildlife habitat. Birds that may potentially use the Project area as a roosting or loafing area and birds using the Piscataqua River in the study area would avoid construction sites and nearby areas affected by noise during construction. It is expected that birds would resume using the upland Project area once construction is complete. Therefore, there would be negligible short-term and no long-term impacts on terrestrial biological resources, either vegetative or wildlife.

Terrestrial Threatened and Endangered Species:

A list of threatened and endangered species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) that may occur in the Project area was developed through the use of the USFWS's Information, Planning, and Conservation System. The Information, Planning, and Conservation System provides information regarding federally designated and/or proposed candidate, threatened, and endangered species; critical habitats; and USFWS refuges that may be present within a Project area (USFWS 2015a). Using this information, it was determined that three federally listed terrestrial species could occur in the Project area (Table 3.0-1) (USFWS, 2015b). Previous coordination with the USFWS Maine Field Office for other construction projects at the Shipyard indicates that no known essential or significant wildlife habitats or federally listed threatened or endangered terrestrial species are occurring on the Shipyard (Navy, 2014). This is a result of the dense, urban development on Seavey Island. Therefore, it was determined that no federally listed threatened or endangered terrestrial species occur in the Project area, and the Proposed Action would have no effect on federally listed terrestrial species.

Table 3.0-1 Federally Listed Threatened, Endangered, and Protected Terrestrial Species Potentially Occuring Near Portsmouth Naval Shipyard

Common Name	*Scientific Name*	*Federal Status*
Birds		
Red Knot	*Calidris canutus rufa*	Threatened
Roseate Tern	*Sterna dougallii dougallii*	Endangered
Bald Eagle	*Haliaeetus leucocephalus*	Protected under the Bald and Golden Eagle Protection Act
Mammals		
Northern Long-eared Bat	*Myotis septentrionalis*	Threatened

While removed from the federal threatened and endangered species list, the bald eagle (*Haliaeetus leucocephalus*) still is federally protected under the Bald and Golden Eagle Protection Act. Given the dense development and human activity on Seavey Island, the occurrence of bald eagles at the Shipyard is likely to be limited to transient individuals that would be expected to avoid construction areas. Bald eagles are not expected to occur in the Project area; therefore, the Proposed Action would have no effect on the species.

A state-listed species, the peregrine falcon (*Falco peregrinus*), is also known to occur in the vicinity of the Shipyard. The peregrine falcon has been observed on the Shipyard, preying on the substantial pigeon and rodent populations on the installation (NAVFAC, 2004a). In the past 10 years, a breeding pair attempting to nest at the Shipyard moved its nesting site off the Shipyard and is now nesting on the I-95 bridge (Martin, 2007; Martin, 2011; Martin, 2015). Peregrine falcons are not expected to occur in the Project area or are transient and would be expected to avoid construction areas. Therefore, the Proposed Action would have no effect on the species.

Land Use: The two projects included under the Proposed Action would not change land use in the Controlled Industrial Area (CIA) and, therefore, would cause no impacts on land use. The Proposed Action would take place entirely on the Shipyard or in the adjacent waters of the Piscataqua River and would cause no direct or indirect (i.e., through induced growth or changes in population) impacts on land use in neighboring communities. Therefore, there would be no impacts on land use.

Potable Water and Wastewater: Construction would not require changes or relocation of potable water and wastewater infrastructure at the project sites. Shipyard operations and personnel loading would not change as a result of the proposed action; therefore, demand for potable water and generation of wastewater at the Shipyard would not change, and there would be no impacts on potable water or wastewater infrastructure.

Airspace: No structures over 200 feet tall or structures meeting the requirements under 14 CFR Part 77 §77.9 that may obstruct airspace used for commercial, military, or private aviation are proposed. Therefore, the Proposed Action would have no impacts on airspace, and coordination with the Federal Aviation Administration is not required.

Public Health and Safety: Construction would be conducted in accordance with established Navy policies for ensuring the health and safety of occupational workers and the general public. The primary occupational safety requirement will be the Office of the Chief of Naval Operations Instructions (OPNAVINST) 5100.23G, Navy Safety and Occupational Health Program Manual, which is compliant with the requirements of the Occupational Safety and Health Administration as well as other U.S. Department of Defense (DOD) instructions governing occupational safety. Construction would take place entirely within the secured perimeter of the Shipyard, and construction areas would not be accessible by the public. Therefore, there would be negligible impacts on public health and safety associated with the Proposed Action.

Socioeconomics: The Proposed Action would have temporary, beneficial impacts on the local economy because of increased temporary employment and expenditures on goods and services during construction. Because the Proposed Action would not result in a change in the number of personnel at the Shipyard, the Proposed Action would not have either beneficial or negative permanent impacts on the local economy.

Environmental Justice: Consistent with Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (February 11, 1994), and EO 13045, Protection of Children from Environmental Health and Safety Risks (April 21, 1997), the Navy's policy is to identify and address any disproportionately high and adverse human or environmental effects of its actions on minority and low-income populations. The Proposed Action would occur on the Shipyard and in adjacent areas of the Piscataqua River. Construction sites would be secured to prevent public access; therefore, construction under the Proposed Action would not present risks to public safety. Following construction, the type and nature of Shipyard operations would not substantially

change. Therefore, the Proposed Action would have no disproportionately high or adverse effects on minority or low-income populations and would not disproportionately expose children to environmental health or safety risks.

Defense Environmental Restoration Program Sites: Shipbuilding and submarine work at the Shipyard have resulted in the release of hazardous substances into environmental media on and around Seavey's Island. Such areas have been studied at the Shipyard under the Defense Environmental Restoration Program (DERP) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), with the goal of protecting human health and the environment from the hazardous substances. The Environmental Response (ER) Program is the Navy's initiative to address the DERP.

Most of the ER Program sites originally identified at the Shipyard have been cleaned up. The site closest to the Project area is Operable Unit 4 (OU4), which consists of Site 5 - Former Industrial Waste Outfalls and various offshore Areas of Concern (AOCs) around Seavey's Island. Four of the former outfalls are located in the Project area and one of the OU4 AOCs—the Dry Docks AOC—partially overlaps some of the offshore areas included in the Proposed Action, including areas adjacent to Berths 11 and 13 and the Dry Dock 3 caisson. The CERCLA Record of Decision was signed for OU4 in August 2013, specifying remedial action (sediment removal) only in areas of OU4 that are not in or near the Project area (Resolution Consultants, 2015). Therefore, no further remedial action is required for those portions of OU4 that are in or near the Project area, and implementing the Proposed Action would have no impact on human health and the environment from hazardous substances managed under the ER Program.

3.1 Air Quality

This discussion of air quality includes criteria pollutants and greenhouse gases (GHGs) and addresses standards, sources, and permitting. Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors, including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. This section also discusses GHG emissions and the effects of climate change.

Most air pollutants originate from human-made sources, including mobile sources (e.g., cars, trucks, construction equipment) and stationary sources (e.g., factories, refineries, power plants), as well as indoor sources (e.g., some building materials and cleaning solvents). Air pollutants are also released from natural sources, such as volcanic eruptions and forest fires.

3.1.1 Regulatory Setting

3.1.1.1 Criteria Pollutants and National Ambient Air Quality Standards

The principal pollutants defining the air quality, called "criteria pollutants," include carbon monoxide(CO), sulfur dioxide(SO_2), nitrogen dioxide (NO_2), ozone(O_3), inhalable particulate matter less than or equal to 10 microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter($PM_{2.5}$), and lead(Pb) (USEPA 2015a). CO, SO_2, NO_2, Pb, and some particulates are emitted directly into the atmosphere from emissions sources. Ozone and some NO_2 and particulates are formed through atmospheric chemical reactions from other pollutant emissions (called "precursors") that are influenced by weather, ultraviolet light, and other atmospheric processes.

Under the CAA, the USEPA has established National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for these pollutants (Table 3.1-1). NAAQS are classified as primary or secondary. Primary standards protect against adverse health effects; secondary standards protect against welfare effects such as damage to farm crops and vegetation and damage to buildings. Some pollutants have long-term and short-term standards. Short-term standards are designed to protect against acute, or short-term, health effects, while long-term standards were established to protect against chronic health effects.

Areas that are and have historically been in compliance with the NAAQS are designated as attainment areas. Areas that violate a federal air quality standard are designated as nonattainment areas. Areas that have transitioned from nonattainment to attainment are designated as maintenance areas and are required to adhere to maintenance plans to ensure continued attainment.

The CAA requires states to develop a general plan to attain and maintain the NAAQS in all areas of the country and a specific plan to attain the standards for each area designated as nonattainment for a NAAQS. These plans, known as State Implementation Plans (SIPs), are developed by state and local air quality management agencies and submitted to the USEPA for approval. The General Conformity Rule is part of the CAA established by the USEPA to ensure that the actions of federal departments or agencies conform to the applicable SIP. The General Conformity Rule applies to federal actions occurring in nonattainment or maintenance areas. The Maine Department of Environmental Protection is responsible for implementing federal and state regulations in the state, including air emissions permitting.

The Shipyard is located in the Town of Kittery, in York County, Maine. This area is in attainment for all criteria pollutants (USEPA, 2015b); therefore, a General Conformity Rule evaluation of the Proposed Action is not required.

Hazardous Air Pollutants

In addition to the NAAQS for criteria pollutants, national standards exist for hazardous air pollutants (HAPs), which are regulated under Section 112(b) of the 1990 CAA Amendments. The National Emission Standards for Hazardous Air Pollutants regulate HAP emissions from stationary sources (40 CFR Part 61).

HAP Mobile Sources

HAPs emitted from mobile sources are called Mobile Source Air Toxics (MSATs). MSATs are compounds emitted from highway vehicles and non-road equipment that are known or suspected to cause cancer or other serious health and environmental effects. In 2001, the USEPA issued its first MSAT Rule, which identified 201 compounds as being HAPs that require regulation. A subset of six of the MSAT compounds was identified as having the greatest influence on health and included benzene, butadiene, formaldehyde, acrolein, acetaldehyde, and diesel particulate matter. In February 2007, the USEPA issued a second MSAT Rule, which generally supported the findings in the first rule and provided additional recommendations of compounds having the greatest impact on health (USEPA, 2015c). The rule also identified several engine-emission certification standards that must be implemented (40 CFR parts 59, 80, 85, and 86; *Federal Register* Volume 72, No. 37, pp. 8427–8570, 2007). Unlike the criteria pollutants, there are no NAAQS for benzene and other HAPs. The primary control methodologies for these pollutants for mobile sources involve reducing their content in fuel and altering the engine operating characteristics to reduce the volume of pollutant generated during combustion.

Table 3.1-1 National Ambient Air Quality Standards

Pollutant [Final Rule Citation]		*Primary/ Secondary*	*Averaging Time*	*Level*	*Form*
Carbon Monoxide (CO)		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead (Pb)		Primary and Secondary	Rolling 3-month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)		Primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		Primary and Secondary	Annual	53 ppb(2)	Annual Mean
Ozone (O_3)		Primary and Secondary	8-hour	0.070 ppm(3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution	$PM_{2.5}$	Primary	Annual	12 µg/m^3	annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m^3	annual mean, averaged over 3 years
		Primary and Secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		Primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: USEPA 2015a.

Notes:

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m^3) as a calendar quarter average) also remain in effect.

(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison with the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet one year since the effective date of designation under the current (2010) standards, and (2)any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is a USEPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

Key:

µg/m^3 = Micrograms per cubic meter.
PM_{10} = Particulate matter less than 10 microns in diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
ppb = Parts per billion
ppm = Parts per million.

Permitting

New Source Review (Pre-construction Permit)

New major stationary emission sources and major modifications at existing major stationary emission sources are required by the CAA to obtain an air pollution permit before commencing construction. This permitting process for major stationary sources is called "new source review" and is required whether the major source or major modification is planned for nonattainment areas or attainment and unclassifiable areas. In general, permits for emission sources in attainment areas and for other pollutants regulated under the major source program are referred to as prevention of significant deterioration (PSD) permits, while permits for major sources emitting nonattainment pollutants and located in nonattainment areas are referred to as nonattainment new source review permits. In addition, a proposed project may have to meet the requirements of nonattainment new source review for the pollutants for which the area is designated as nonattainment and PSD permitting requirements for the pollutants for which the area is designated as attainment. Additional PSD permitting thresholds apply to increases in stationary source GHG emissions. PSD permitting can also apply to a new major stationary source (or any net emissions increase associated with a modification to an existing major stationary source) that is constructed within 6.2 miles of a Class I area and that would increase the 24-hour average concentration of any regulated pollutant in the Class I area by 1 microgram per cubic meter ($\mu g/m^3$) or more. Navy installations comply with applicable permit requirements under the PSD program per 40 CFR Section 51.166.

Title V (Operating Permit)

The Title V Operating Permit Program consolidates all CAA requirements applicable to the operation of a source, including requirements from the SIP, pre-construction permits, and the air toxics program. It applies to stationary sources of air pollution that exceed the major stationary source emission thresholds as well as other non-major sources specified in a particular regulation. The program includes a requirement for payment of permit fees to finance the operating permit program whether implemented by the USEPA or a state or local regulator. Navy installations subject to Title V permitting shall comply with the requirements of the Title V Operating Permit Program, which are detailed in 40 CFR Part 70 and all specific requirements contained in their individual permits.

3.1.1.2 Greenhouse Gases and Climate Change

GHGs are gas emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. Scientific evidence indicates a trend of increasing global temperature over the past century due to an increase in GHG emissions from human activities. The climate change associated with this global warming is predicted to produce negative economic and social consequences around the globe.

In the Northeast, communities must prepare for increases in precipitation, sea level rise, and heat waves. Regionally, sea levels have already risen by approximately 1 foot since 1900, resulting in more frequent flooding of coastal areas. Sea-level rise and coastal flooding are projected to increase an additional 1 to 4 feet globally by 2100, with greater increases possible in the Northeast because of "the combined effects of warming waters and local land subsidence (sinking)" (USEPA, 2015d). Regional sea level rise is likely to cause increased risk of damage to coastal infrastructure (USEPA, 2015d).

Revised draft guidance from the CEQ, dated December 18, 2014, recommends that agencies consider both the potential effects of a Proposed Action on climate change, as indicated by its estimated GHG

emissions, and the implications of climate change for the environmental effects of a Proposed Action. The guidance also emphasizes that agency analyses should be commensurate with projected GHG emissions and climate impacts and should employ appropriate quantitative or qualitative analytical methods to ensure useful information is available to inform the public and the decision-making process in distinguishing between alternatives and mitigations. It recommends that agencies consider 25,000 metric tons (MT) of carbon dioxide equivalent (CO_2e) emissions on an annual basis as a reference point below which a quantitative analysis of GHGs is not recommended unless it is easily accomplished based on available tools and data.

The USEPA issued the Final Mandatory Reporting of Greenhouse Gases Rule on September 22, 2009. GHGs covered under the Final Mandatory Reporting of Greenhouse Gases Rule are CO_2, methane, nitrogen oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. Each GHG is assigned a global warming potential. The global warming potential is the ability of a gas or aerosol to trap heat in the atmosphere. The global warming potential rating system is standardized to CO_2, which has a value of one. The equivalent CO_2 rate is calculated by multiplying the emissions of each GHG by its global warming potential and adding the results together to produce a single, combined emissions rate representing all GHGs. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of mobile sources and engines, and facilities that emit 25,000 $MTCO_2e$ or more per year of GHG emissions are required to submit annual reports to the USEPA.

GHG emissions are also regulated under PSD and Title V permitting programs, which were initiated by a USEPA rule issued on June 3, 2010, known as the GHG Tailoring Rule (75 *Federal Register* 31514). The GHG emission thresholds for permitting of stationary sources are an increase of 75,000 tons per year (tpy) of CO_2e at existing major sources and facility-wide emissions of 100,000 tpy of CO_2e for a new source or a modification of an existing minor source. Only sources otherwise subject to Title V permitting are subject to CO_2e requirements.

Federal agencies are required to address GHG emissions with emission-reduction planning. On March 19, 2015, President Obama issued EO 13693, Planning for Federal Sustainability in the Next Decade, which requires federal agencies to meet emission-reduction goals associated with energy use, water use, building design and utilization, fleet vehicles, and procurement and acquisition decisions. The CEQ provided federal agencies with implementation guidance to meet these new goals (CEQ, 2015).

In an effort to reduce energy consumption, GHGs, and dependence on petroleum, and increase the use of renewable energy resources, the Navy has implemented a number of renewable energy projects. The Navy has established Fiscal Year 2020 GHG emission-reduction targets of 34 percent from a fiscal year 2008 baseline for direct GHG emissions and 13.5 percent for indirect emissions (DOD, 2014). Examples of Navy-wide GHG reduction projects include energy-efficient construction, thermal and photovoltaic solar systems, geothermal power plants, and the generation of electricity with wind energy. The Navy continues to promote and install new renewable energy projects.

3.1.2 Affected Environment

The Shipyard is in York County, Maine, which is within the Metropolitan Portland Intrastate Air Quality Control Region 110, which also includes Androscoggin, Cumberland, and Sagadahoc counties. York County is designated as in attainment/unclassifiable for all criteria pollutants (USEPA, 2015b). The entire state of Maine is located within the Northeast Ozone Transport Region. The Northeast Ozone Transport Region was established by the 1990 amendments to the CAA and comprises Connecticut, Delaware,

Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont, as well as the District of Columbia and portions of the Northern Virginia suburbs. The most recent emissions inventory for the Metropolitan Portland Intrastate Air Quality Control Region is shown in Table 3.1-2. Volatile organic compound (VOC) and nitrogen oxide (NO_x) emissions are used to represent ozone generation because they are precursors of ozone.

Table 3.1-2 Metropolitan Portland Intrastate Air Quality Control Region (MPIAQR) 110 Air Emissions Inventory (2011)

Location	*NO_x (tpy)*	*VOCs (tpy)*	*CO (tpy)*	*SO_2 (tpy)*	*PM_{10} (tpy)*	*$PM_{2.5}$ (tpy)*
York County	6,968	6,440	34,587	1,188	6,240	2,246
Androscoggin County	3,032	3,075	17,190	764	2,826	1,063
Cumberland County	11,705	9,476	49,274	3,429	6,652	2,807
Sagadahoc County	1,509	2,569	9,377	265	1,104	445
Total MPIAQR	23,214	21,560	110,428	5,646	16,822	6,561

Source: USEPA, 2015e

Key:
CO = carbon monoxide.
PM_{10} = Particulate matter less than 10 microns in diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
NO_x = nitrogen oxide.
SO_2 = sulfur dioxide.
tpy = tons per year.
VOCs = volatile organic compounds.

The Shipyard is classified as a major source of emissions and operates under an Air Pollution Control Title V Permit (No. A-452-70-C-R). A variety of sources on the Shipyard emit criteria pollutants, including generators, boilers, hot water heaters, air compressors, fuel storage tanks, surface coatings/paint areas, and various items of heavy machinery. Recent annual criteria pollutant emissions reported for the Shipyard are shown in Table 3.1-3.

Table 3.1-3 Reported Criteria Pollutant Air Emissions Inventory for Portsmouth Naval Shipyard

Year	*NO_x (tpy)*	*VOCs (tpy)*	*CO (tpy)*	*SO_2 (tpy)*	*PM_{10} (tpy)*	*$PM_{2.5}$ (tpy)*
2011	29.11	21.73	7.62	0.21	3.31	2.84
2012	27.57	18.85	7.19	0.21	3.26	2.74
2013	32.12	25.78	9.02	0.24	3.32	2.78

Source: MEDEP 2015

Key:
CO = carbon monoxide.
PM_{10} = Particulate matter less than 10 microns in diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
NO_x = nitrogen oxide.
SO_2 = sulfur dioxide.
tpy = tons per year.
VOCs = volatile organic compounds.

3.2 Water Resources

This discussion of water resources includes surface water, marine sediments, wetlands, and floodplains. This section discusses the physical characteristics of surface waters and wetlands; estuarine wildlife and vegetation are addressed in Section 3.5, Biological Resources.

Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community or locale. A Total Maximum Daily Load is the maximum amount of a substance that can be assimilated by a water body without causing impairment. A water body can be deemed impaired if water quality analyses conclude that exceedances of water quality standards have occurred.

Wetlands are jointly defined by USEPA and the U.S. Army Corps of Engineers (USACE) as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands generally include "swamps, marshes, bogs and similar areas" (40 CFR section 230.3[t] and 33 CFR section 328.3[b]).

Floodplains are areas of low, level ground present along rivers, stream channels, large wetlands, or coastal waters. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, and nutrient cycling. Floodplains also help to maintain water quality and are often home to a diverse array of plants and animals. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow of water reaches the main water body. Floodplain boundaries are most often defined in terms of frequency of inundation—that is, the 100-year and 500-year flood. Floodplain delineation maps are produced by the Federal Emergency Management Agency (FEMA) and provide a basis for comparing the locale of the Proposed Action to the floodplains.

Sediments are the solid fragments of organic and inorganic matter created from weathering rock transported by water, wind, and ice (glaciers) and deposited at the bottom of bodies of water. Components of sediment range in size from boulders, cobble, and gravel to sand (particles 0.05 to 2.0 millimeters [mm] in diameter), silt (0.002 to 0.05 mm), and clay (less than or equal to 0.002 mm). Sediment may also be produced locally as nonliving particulate organic material ("detritus") that falls to the bottom of a waterbody (Hollister, 1973; Milliman et al., 1972). Through the downward movement of organic and inorganic particles in the water column, substances that are otherwise scarce in the water column (e.g., metals) are concentrated in bottom sediment (Chapman et al., 2003; Kszos et al., 2003).

3.2.1 Regulatory Setting

Groundwater quality and quantity are regulated under several statutes and regulations, including the Safe Drinking Water Act.

To restore and maintain the chemical, physical, and biological integrity of water, the Clean Water Act (CWA) establishes federal limits, through the National Pollutant Discharge Elimination System (NPDES) program, on the amounts of specific pollutants that can be discharged into surface waters. The NPDES program regulates the discharge of point (i.e., end of pipe) and nonpoint (i.e., stormwater) sources of water pollution. Permitting requirements under the NPDES are delegated to individual states.

Waters of the United States are defined as (1) traditional navigable waters, (2) wetlands adjacent to navigable waters, (3) non-navigable tributaries of traditional navigable waters that are relatively permanent, where the tributaries typically flow perennially or have continuous flow at least seasonally

(e.g., typically 3 months), and (4) wetlands that directly abut such tributaries under Section 404 of the CWA, as amended, and are regulated by USEPA and the USACE. The CWA requires that Maine establish a Section 303(d) list to identify impaired waters and establish total maximum daily Loads for the sources causing the impairment.

Section 438 of the Energy Independence and Security Act (42 U.S.C. section 17094) establishes stormwater design requirements for development and redevelopment projects. Under these requirements, federal facility projects larger than 5,000 square feet must "maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow."

The Maine NPDES stormwater program requires construction site operators engaged in clearing, grading, and excavating activities that disturb 1 acre or more to obtain coverage under an NPDES Construction General Permit for stormwater discharges. Construction or demolition that necessitates an individual permit also requires preparation of a Notice of Intent to discharge stormwater and a Storm Water Pollution Prevention Plan that is implemented during construction. As part of the 2010 Final Rule for the CWA, titled *Effluent Limitations Guidelines and Standards for the Construction and Development Point Source Category*, activities covered by this permit must implement non-numeric erosion and sediment controls and pollution prevention measures.

Wetlands are currently regulated by the USACE under Section 404 of the CWA as a subset of all "Waters of the United States." The term "Waters of the United States" has a broad meaning under the CWA and incorporates deepwater aquatic habitats and special aquatic habitats, including wetlands. Jurisdictional Waters of the United States regulated under the CWA include coastal and inland waters, lakes, rivers, ponds, streams, intermittent streams, and "other" waters that, if degraded or destroyed, could affect interstate commerce. The full regulatory definition of Waters of the United States is provided in the CWA.

EO 11990, Protection of Wetlands, requires that federal agencies adopt a policy to avoid, to the extent possible, long- and short-term adverse impacts associated with destruction and modification of wetlands and to avoid the direct and indirect support of new construction in wetlands whenever there is a practicable alternative.

Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredge or fill into wetlands and other Waters of the United States. Any discharge of dredge or fill into Waters of the United States requires a permit from the USACE. Section 401 of the CWA requires states to review federal permit applications and certify that the permitted activities will meet state water quality standards.

Maine administers section 401 certification under the Maine Natural Resources Protection Act (NRPA). The NRPA was established to protect the state's significant natural resources. Under the NRPA, a permit is required for any activity that takes place in, on, or over protected natural resources, including coastal sand dune systems, coastal wetlands, significant wildlife habitat, fragile mountain areas, freshwater wetlands, great ponds and rivers, and streams or brooks. A permit also is required for any activity located "adjacent to and within 75 feet, measured horizontally" of a coastal wetland, great pond, river, stream or brook, or significant wildlife habitat contained within a freshwater wetland, or certain freshwater wetlands (Maine DEP, 2013b).

Section 10 of the Rivers and Harbors Act provides for USACE permit requirements for any in-water construction. USACE and some states require a permit for any in-water construction. Permits are required for construction of piers, wharfs, bulkheads, pilings, marinas, docks, ramps, floats, moorings, and like structures; construction of wires and cables over the water, and pipes, cables, or tunnels under the water; dredging and excavation; any obstruction or alteration of navigable waters; depositing fill and dredged material; filling of wetlands adjacent or contiguous to Waters of the U.S.; construction of riprap, revetments, groins, breakwaters, and levees; and transportation of dredged material for dumping into ocean waters.

EO 11988, Floodplain Management, requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development unless it is the only practicable alternative. Flood potential of a site is usually determined by the 100-year floodplain, which is defined as the area that has a 1-percent chance of inundation by a flood event in a given year.

The Coastal Zone Management Act of 1972 (CZMA) provides assistance to states, in cooperation with federal and local agencies, for developing land and water use programs in coastal zones. Section 307 of the CZMA stipulates that where a federal project initiates reasonably foreseeable effects on any coastal use or resource (land or water use, or natural resource), the action must be consistent to the maximum extent practicable with the enforceable policies of the affected state's federally approved coastal management plan. The Maine Department of Agriculture, Conservation and Forestry, Bureau of Resource Information and Land Use Planning, Maine Coastal Program (Maine Coastal Program) is the lead agency for coastal management and is responsible for enforcing the state's federally approved coastal management plan. However, federal lands, which are "lands the use of which is by law subject solely to the discretion of…the Federal Government, its officers, or agents," are statutorily excluded from the state's "coastal zone." If, however, the proposed federal activity affects coastal resources or uses beyond the boundaries of the federal property (i.e., has spillover effects), the CZMA Section 307 federal consistency requirement applies. As a federal agency, the Navy is required to determine whether its proposed activities would affect the coastal zone. This takes the form of either a Negative Determination or a Consistency Determination. The Consistency Determination for the Proposed Action is provided in Appendix B. [NOTE: Appendix B will be included once consultation under the CZMA is complete.]

3.2.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under water quality resources at the Shipyard.

3.2.2.1 Surface Water

The Shipyard is located on Seavey's Island in the lower Piscataqua River. The Piscataqua River drainage basin encompasses approximately 1,495 square miles in New Hampshire and Maine and is part of an extensive estuarine system, the Great Bay estuary, which supports diverse aquatic life ranging from commercial and recreationally important fisheries to aquatic vegetation (eelgrass) (Navy, 2004b). The intertidal waters around the Shipyard are characterized by lowland marshes, tidal mudflats, and channels of the tidal harbor located between Portsmouth and the Atlantic Ocean (U.S. Department of Health and Human Services, 2007). The Shipyard is separated from the Town of Kittery by the Back

Channel of the Piscataqua River, a popular fishing spot (U.S. Department of Health and Human Services, 2007).

Surface water bodies on the Shipyard include two freshwater ponds (Upper Meade Pond and Lower Meade Pond), which are each approximately 5 acres in size. These ponds are located in the southern portion of the Shipyard. Surface waters on and near the Shipyard are shown on Figure 3.2-1.

The Dry Dock 3 caisson and Berths 11, 12, and 13 are in-water facilities and are submerged to varying degrees between low and high tides. The proposed action would involve limited construction work in areas along Berths 11, 12, and 13 and at the entrance to Dry Dock 3. These areas are adjacent to the Piscataqua River.

State Water Quality Standards

Maine has established three state surface water classifications for estuarine and marine waters, including the waters of the Great Bay estuary: SA, SB, and SC[2], as indicated in Section 465-B of the Marine Revised Statutes Annotated (M.R.S.A.). Class SC represents the third-highest classification of waters. The Piscataqua River surrounding the Shipyard is classified as SC for water-contact recreation and fishing (U.S. Department of Health and Human Services, 2007). New Hampshire designates two classes of surface waters: Class A and Class B[3], as indicated in Section 485-A:8 of the New Hampshire Water Management and Protection Regulations. The lower Piscataqua River near Portsmouth, New Hampshire, is classified as Class B water.

Table 3.2-1 provides the established designated uses for Class SC surface waters in Maine and Class B waters in New Hampshire.

Table 3.2-1 Maine and New Hampshire Designated Uses for the Piscataqua River near Portsmouth Naval Shipyard

Designated Uses	
Maine (Class SC Waters Only)	***New Hampshire (Class B Waters Only)***
Recreation	Fish Consumption
Fishing	Shellfish Consumption
Aquaculture	Drinking Water Supply after Adequate Treatment
Propagation and Harvesting of Shellfish	Primary Contact Recreation
Navigation	Secondary Contact Recreation
Habitat for Fish and Other Estuarine and Marine Life	

[2] The "Class SA" designation is applied to waters that are outstanding natural resources and should be preserved for their ecological, social, scenic, economic, or recreational importance. "Class SB" waters are suitable for recreation in and on the water, fishing, aquaculture, shellfish propagation and harvesting, industrial water use, hydroelectric power generation, and navigation, and as habitat for wildlife. The habitat must be characterized as unimpaired. "Class SC" waters are suitable for recreation in and on the water, fishing, aquaculture, restricted harvesting of shellfish, industrial water use, hydroelectric power generation, navigation, and as habitat for wildlife (M.R.S.A. Section 465-B).

[3] Class A waters are the highest quality waters and are considered as being potentially acceptable for water supply uses after adequate treatment. Class B waters are of the second-highest quality and are considered acceptable for fishing, swimming, and other recreational purposes and, after adequate treatment, for use as water supplies. The majority of the state's waters are Class B.

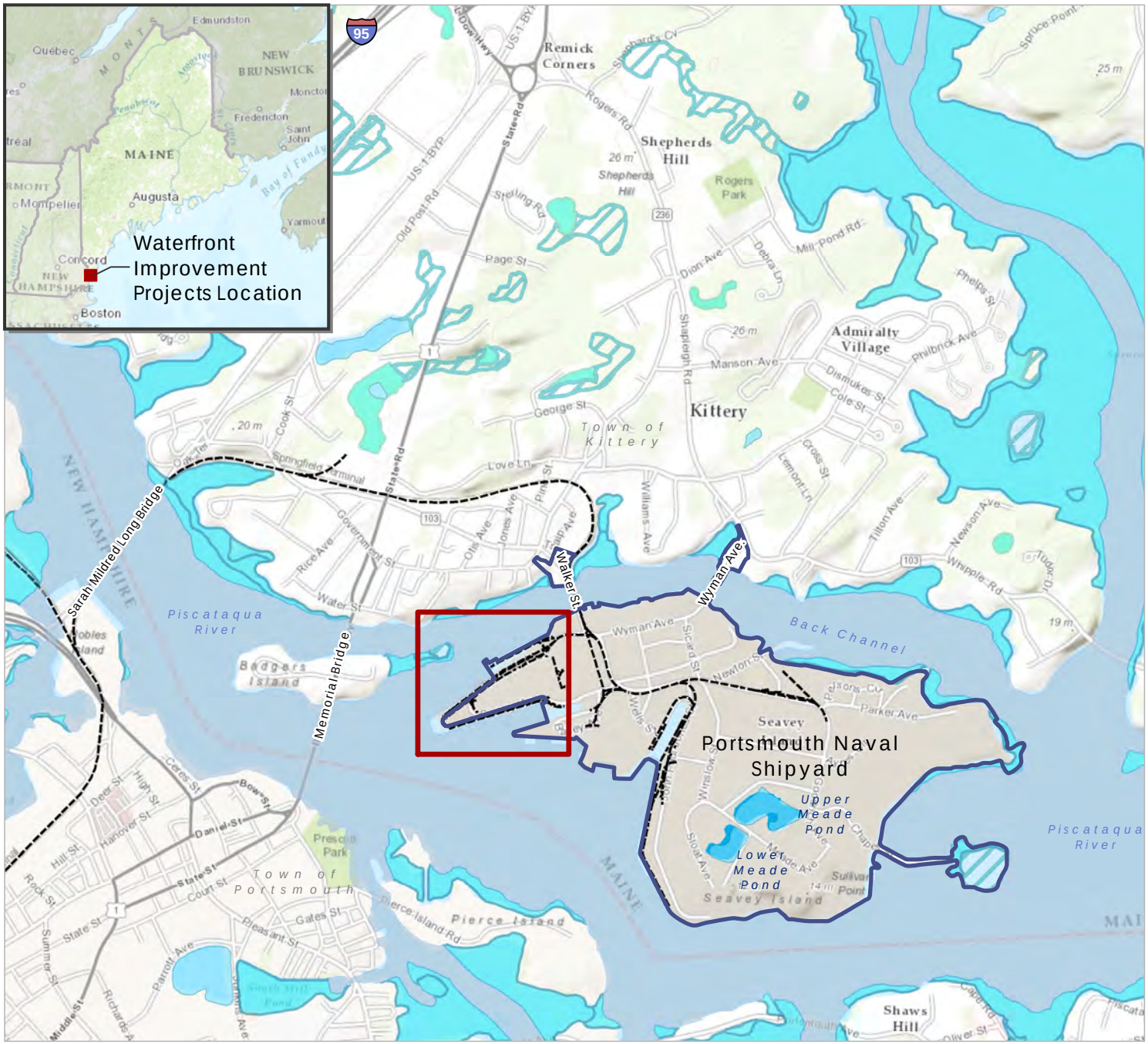

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Figure 3.2-1
Water Resources
Portsmouth Naval Shipyard
York County, Maine

Legend

- Project Area
- Installation Area
- Railroad
- Lake / Pond

National Wetlands Inventory Wetland Type

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

N

0 500 1,000 1,500 2,000 Feet

Source: ESRI 2013; Department of Defense 2014; Maine Department of Transportation 2011; Maine NHD 2013; NWI 2013.

According to the Maine *2012 Integrated Water Quality Monitoring and Assessment Report*, the Piscataqua River estuary is listed as impaired under Section 303(d) for the designated use of marine life. The cause of the impairment has been identified as nutrients/eutrophication (i.e., the river is receiving excess nutrients that stimulate plant and, specifically, algal growth) with an unknown source (MEDEP, 2012). Additionally, the Piscataqua River in the vicinity of Kittery is listed as impaired due to elevated fecal levels.

The State of New Hampshire has listed the lower Piscataqua River on the 2012 Impaired Waters List (303[d]) for impairment of three designated uses: aquatic life, fish consumption, and shellfishing. Aquatic life is listed as impaired based on estuarine bioassessments taking into account the density and area of eelgrass habitat, fish consumption is listed as impaired due to mercury and polychlorinated biphenyls (PCBs), and shellfishing is listed as impaired due to dioxins, mercury, and PCBs (New Hampshire Department of Environmental Services, 2014).

3.2.2.2 Wetlands

The main channel and Back Channel of the Piscataqua River are considered an estuarine and marine deepwater wetland (E1UBL), defined as a deepwater tidal habitat with an unconsolidated bottom that is continuously submerged (National Wetland Inventory [NWI], 2016). According to National Wetlands Inventory data, estuarine intertidal and marine intertidal wetlands also are located in the vicinity of the Project area along the eastern shoreline of Badger's Island, approximately 400 feet west-northwest of Dry Dock 3 and the northern shoreline of the Back Channel of the Piscataqua River, approximately 600 feet north of the northern side of Dry Dock 3 (NWI, 2015). Palustrine forested and/or palustrine shrub wetlands occur along the northeastern shoreline of Badger's Island. (NWI, 2015)

3.2.2.3 Floodplains

Portions of the northern, eastern, and southwestern shores of the Shipyard are within the 100- and 500-year floodplains (see Figure 3.2-2). According to the most recent effective flood insurance rate map produced by FEMA for the Shipyard, in effect since 1986, the majority of the Project area is outside of the 100-year and 500-year floodplains and has a minimal chance of flooding (FEMA, 1986). Approximately the southwestern half of the flat-iron pier between Berths 1 and 2 is included in the 500-year floodplain, and the waters of the Piscataqua River and the interiors of Dry Docks 1 and 3 are included in the 100-year floodplain (FEMA, 1986).

In 2013, FEMA released preliminary updated flood insurance rate maps for York County. According to the preliminary flood insurance rate mapping, FEMA has delineated 100-year floodplains (now called special flood hazard areas, or areas subject to inundation by the 1-percent annual-chance flood) on and around the Shipyard as Zones AE and VE (FEMA, 2013). Zone AE signifies a special flood hazard area where base flood elevations have been determined. Zone VE signifies a coastal flood zone with velocity hazards from wave action where base flood elevations have been determined. The majority of the Project area, including the fitting-out pier between Berths 11 and 13 and the flat-iron pier between Berths 1 and 2, is designated Zone AE with a base flood elevation of 10 feet (see Figure 3.2-2) (FEMA, 2013). The waters of the Piscataqua River in the Project area, including the interior of Dry Dock 1, have been designated Zone VE with a base flood elevation of 14 feet. The river and the interior of Dry Dock 1 also are mapped as floodway areas, or areas that "must be kept free of encroachment so the 1% annual

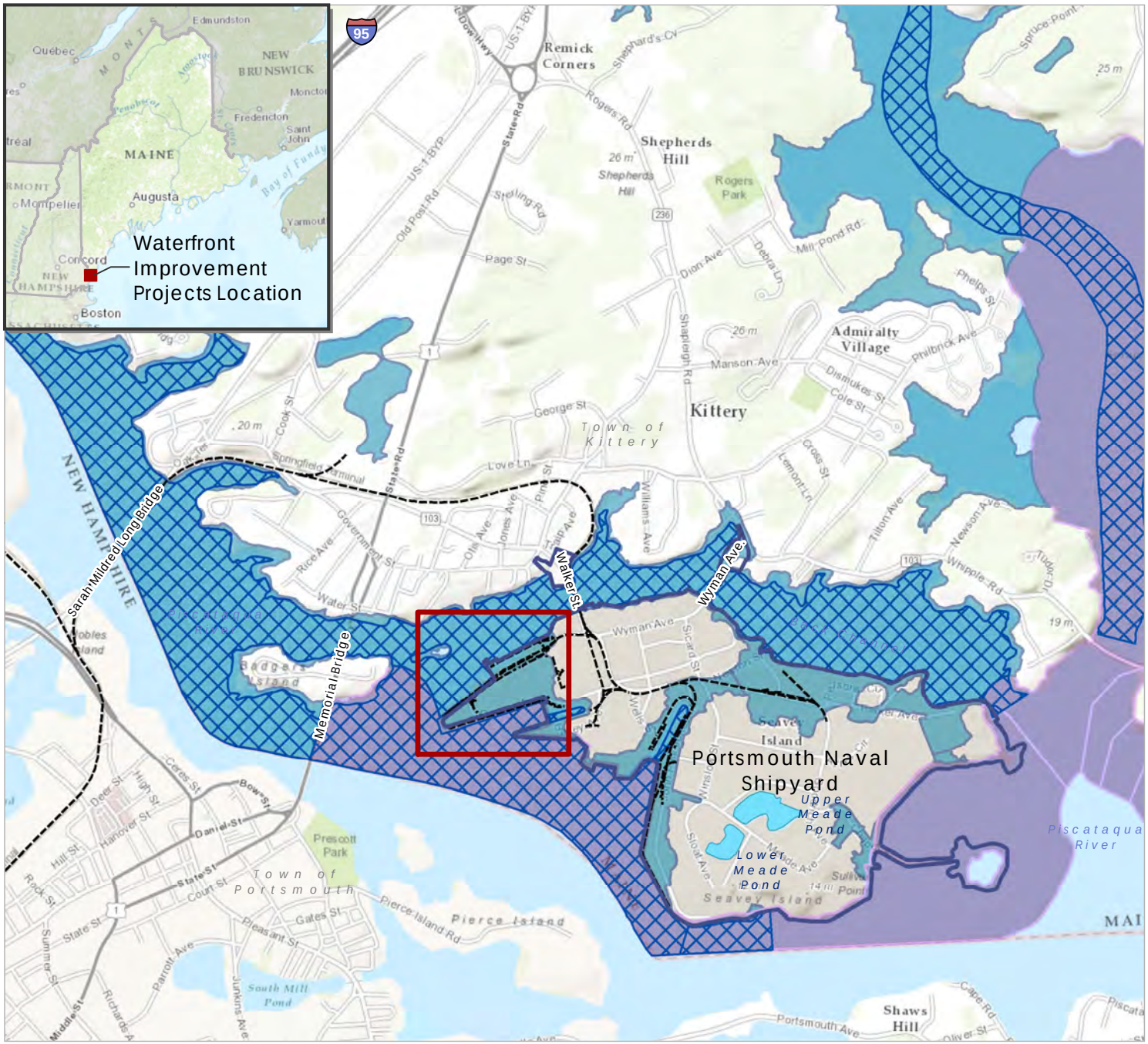

Figure 3.2-2
FEMA Flood Zones
Portsmouth Naval Shipyard
York County, Maine

Legend

- Project Area
- Installation Area
- Railroad
- Lake / Pond

FEMA Flood Zone

- Zone AE (Special flood hazard area where base flood elevations have been determined)
- Zone VE (Coastal flood zone with velocity hazards from wave action where base flood elevations have been determined)
- Floodway

N

0 500 1,000 1,500 2,000 Feet

Source: ESRI 2013; FEM 2015; Department of Defense 2014; Maine Department of Transportation 2011.

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chance flood can be carried without substantial increases in flood heights" (FEMA, 2013). The 2013 mapped flood zones are not yet effective but are shown on Figure 3.2-2 as the most recent information available from FEMA.

3.2.2.4 Marine Sediments

The lower Piscataqua River bottom is primarily a hard substrate, consisting largely of rock ledge, gravel, and cobble. Little sedimentation occurs due to the high tidal currents in the lower estuary (Normandeau Associates, Inc., 2013).

During a 2014 benthic survey of in-water parts of the Project area, underwater video data were collected to characterize the bottom substrate and help select the best locations for benthic grab surveys. Bottom substrates identified included soft mud, sand, pebble/cobble, small boulder, and shell. Larger substrate grain sizes were found toward the end of the piers where the velocity of bottom currents increased in a westerly direction (CR Environmental, Inc., 2014)

Industrial operations, sewage treatment plant discharge, and other upstream sources in the vicinity of the Shipyard have contaminated river sediments in the Project area. Contamination also has resulted from shipbuilding and submarine work at the Shipyard that have resulted in the release of hazardous substances. As noted in the introduction to Chapter 3, the Navy has investigated areas of contamination in OU4, which partially overlaps some of the offshore areas included in the Proposed Action, including areas adjacent to Berths 11 and 13 and the Dry Dock 3 caisson, under the ER Program. The CERCLA Record of Decision was signed for OU4 in August 2013, specifying remedial action (sediment removal) only in areas of OU4 that are not in or near the Project area (Resolution Consultants, 2015). No further remedial action is required to address sediment contamination in those portions of OU4 that are in or near the Project area.

3.3 Bathymetry

Bathymetry is described in terms of the topography of the sea floor or river bottom where the Proposed Action would occur.

3.3.1 Regulatory Setting

The Rivers and Harbors Act of 1988 awards authority over navigation to the USACE. Section 10 of the act awards the USACE with the authority to approve construction of smaller structures, such as wharves, booms, and bulkheads, as well as approve dredging and filling operations. Alterations of any navigable Water of the U.S. must be approved prior to construction or demolition.

3.3.2 Affected Environment

The lower Piscataqua River that makes up the channel to the south of the Shipyard is characterized by swift tides and deep channels. Southwest of the Project area, the river ranges in depth from approximately 40 to 70 feet. The waters to the west, between Badgers Island and the Project area, are much shallower, ranging from 3 feet in marshy areas to 27 feet deep. The Back Channel north of Dry Dock 3 ranges in depth from approximately 10 to 24 feet (NOAA 2013). Water depths in the Project area recorded during the 2014 benthic survey ranged from approximately 17 feet where Berth 11 meets Dry Dock 1 to approximately 40 feet at the western end of Berth 11. Most of the locations surveyed were at depths of 25 feet to 35 feet (CR Environmental, Inc., 2014). Berths 11, 12, and 13 and the entrances to

Dry Docks 1 and 3 are regularly dredged to their permitted depths, which range from 32 to 38 feet (plus 2 feet of overdredge).

3.4 Cultural Resources

This discussion of cultural resources includes prehistoric and historic archaeological sites; historic buildings, structures, and districts; and physical entities and human-made or natural features important to a culture, a subculture, or a community for traditional, religious, or other reasons. Cultural resources can be divided into three major categories:

- Archaeological resources (prehistoric and historic) are locations where human activity measurably altered the earth or left deposits of physical remains.
- Architectural resources include standing buildings, structures, landscapes, and other built-environment resources of historic or aesthetic significance.
- Traditional cultural properties may include archaeological resources, structures, neighborhoods, prominent topographic features, habitat, plants, animals, and minerals that Native Americans or other groups consider essential for the preservation of traditional culture.

3.4.1 Regulatory Setting

Cultural resources are governed by other federal laws and regulations, including the National Historic Preservation Act (NHPA), Archeological and Historic Preservation Act of 1974, American Indian Religious Freedom Act of 1978, Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990. Federal agencies' responsibility for protecting historic properties is defined primarily by Sections 106 and 110 of the NHPA. Section 106 requires federal agencies to take into account the effects of their undertakings on historic properties. Section 110 of the NHPA requires federal agencies to establish—in conjunction with the Secretary of the Interior—historic preservation programs for the identification, evaluation, and protection of historic properties. Cultural resources also may be covered by state, local, and territorial laws.

3.4.2 Affected Environment

Cultural resources that are listed in the National Register of Historic Places (NRHP) or eligible for listing in the NRHP are "historic properties" as defined by the NHPA. The list was established under the NHPA and is administered by the National Park Service on behalf of the Secretary of the Interior. The NRHP includes properties on public and private land. Properties can be determined eligible for listing in the NRHP by the Secretary of the Interior or by a federal agency official with concurrence from the applicable State Historic Preservation Office. A NRHP-eligible property has the same protections as a property listed in the NRHP. Historic properties include archaeological and architectural resources.

The Navy has conducted inventories of cultural resources at the Shipyard to identify historic properties that are listed or potentially eligible for listing in the NRHP (Hardlines Design Company, 2012).

The area of potential effects (APE) for cultural resources is the geographic area or areas within which an undertaking (project, activity, program, or practice) may cause changes in the character or use of any historic properties present. The APE is influenced by the scale and nature of the undertaking and may be different for various kinds of effects caused by the undertaking. For this Proposed Action, the Navy defined separate APEs for each of the proposed projects; historic resources within the APEs have the potential to be directly or indirectly impacted. The APEs are described below and shown on Figure 3.4-1:

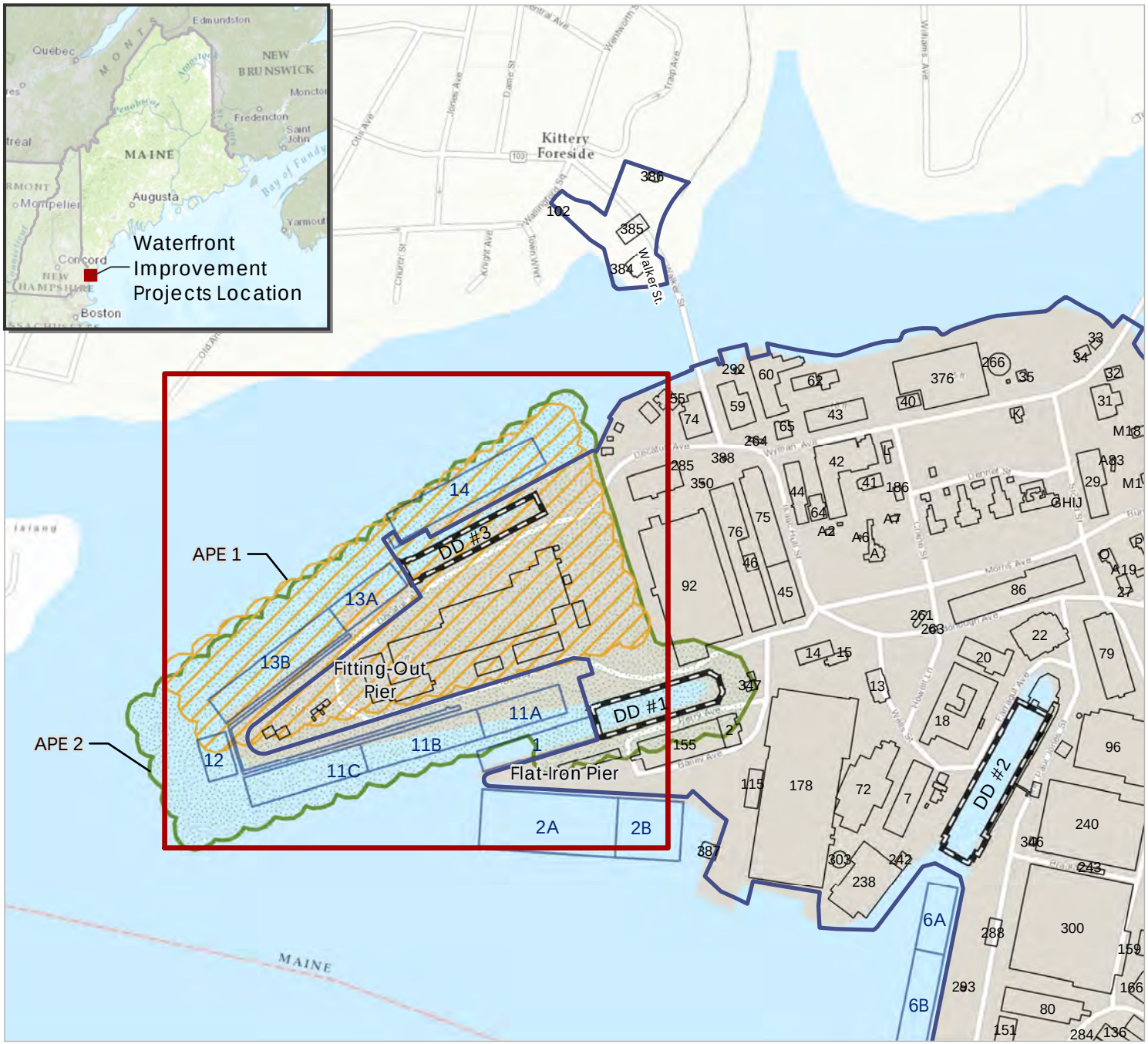

Figure 3.4-1
Cultural Resources Area of Potential Effect Portsmouth Naval Shipyard
York County, Maine

Legend

- Project Area
- Installation Area
- Berth
- Dry Dock
- Existing Structures
- APE 1: Dry Dock 3 Caisson Replacement
- APE 2: Berths 11, 12, and 13 Structural Repairs

N

0 250 500 750 1,000 Feet

Source: ESRI 2013; Department of Defense 2014; Maine Department of Transportation 2011; Maine NHD 2013; NWI 2013.

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- Berths 11, 12, and 13 Structural Repairs: the APE includes Dry Docks 1 and 3; Buildings 174, 175, 277, 278, 289, 291, 299, 311, 330, 392, PW1, and Welding House (WH) 3; Berths 11 (A, B, and C), 12, and 13; and the historic crane and railroad system. A portion of Buildings 2, 92, 155 (scheduled for demolition), and 347 and portions of Berths 1 and 14 also are included.
- Dry Dock 3 Caisson Replacement: the APE includes Dry Dock 3; Buildings 174, 175, 289, 291, 299, and WH3; Berths 13 (A and B) and 14; portions of Buildings 277, 278, 311, 330, and 392; and a portion of Berth 12.

3.4.2.1 Archaeological Resources

The two APEs are in areas that are a combination of original land associated with both Dennett's Island and Pumpkin Island and made land (i.e., fill). The results of a 2006 archaeological sensitivity assessment indicate that the APEs do not contain any previously recorded prehistoric archaeological sites and are not in areas that are considered sensitive for the presence of previously unidentified prehistoric archaeological resources (Navy, 2006a).

The prehistoric archaeological sensitivity of these areas was again evaluated as part of the 2012 Integrated Cultural Resources Management Plan (ICRMP) for the Shipyard. This document indicates that "given the extensive development that has taken place along the shoreline of the Back Channel and Jenkins Gut on Seavey's and Dennett's islands…any areas of sensitivity would be limited to possible deeply buried landscapes" (Hardlines Design Company, 2012).

No historic archaeological sites have been identified within the APE for the Berths 11, 12, and 13 structural repairs or the APE for the Dry Dock 3 caisson replacement.

Portions of the quay wall system, an archaeological feature, also may be found within the APEs, especially in those areas located near Berths 1 and 2 and Building 174.

The following provides a description of the quay wall system:

- **Quay Wall.** The quay wall system is a significant archaeological resource that dates to the second quarter of the nineteenth century. Portions of the system were constructed along the western and southern sections of Dennett's Island (the original island that was occupied by the Shipyard). The system was used as breakwater, wharves, boat slips, and a timber basin (Fulk 2011). Over time, portions of the quay wall system have been buried by development within the Shipyard.

A portion of the system was uncovered as part of the P-268 project at Building 174, which is included in both APEs (Wheeler 2010). This section of the buried quay wall was constructed during the mid-nineteenth century. It enclosed the side of a timber basin that supplied the nearby timber sheds, saw sheds, and Shiphouse No. 4 for the construction of wooden ships (Wheeler & Booth, 2004). The circa-1840s quay wall remnants are considered an important resource within the historic context of the development of the Shipyard and of military engineering at the Shipyard and have been recommended as eligible for listing in the NRHP under Criterions B, C, and D (Wheeler & Booth, 2004; Wheeler, 2010).

The historic archaeological feature provides some insight about the types of historic resources that potentially could be encountered inside the APEs. Archaeological monitoring conducted as part of numerous projects within the Shipyard also has revealed the potential for other archaeological resources, including other locations of quay walls and potential remnants of demolished buildings. For instance, Building 155, located in the Berths 11, 12, and 13 Structural Replacement APE and scheduled

for demolition, covers the area once encompassed by an early office (in 1826) and the Building 1 offices and store house (Cofelice and Wheeler 2013). As noted in the 2012 ICRMP, the entire APEs have not been subject to archaeological investigations (Hardlines Design Company, 2012).

In addition, while no formal underwater archaeological survey has been performed at the Shipyard, a preliminary assessment of underwater archaeological sensitivity was prepared in 2002. This assessment noted that the construction of quay walls and berths and dredging activities along the western shore of the Shipyard throughout its history would have periodically removed bottom sediments down to the bedrock, thereby limiting the potential for intact archaeological resources in Piscataqua River sediments adjacent to the Shipyard (Hardlines Design Company, 2012)

The potential for unidentified historic archaeological resources to occur in each of the APEs is discussed below.

Berths 11, 12, and 13 Structural Repairs

The Shipyard has been subject to regular maintenance dredging activities since 1925. This, along with the construction of quay walls, berths, and the swiftly moving Piscataqua current, suggests that the likelihood for submerged intact historic archaeological resources within the APE is low. In addition, shipwrecks containing significant information are unlikely to be present in the waters around Portsmouth, and, if extant, natural decay would have removed much, if not all, of the detectable remains (Hardlines Design Company, 2012). Within the fitting out pier, much of the APE is considered to lack archaeological sensitivity due to processes such as land filling and cutting, as well as grading associated with building construction and demolition. Thus, the APE for this project is not in an area that is considered sensitive for historic archaeological resources (Weinstein, 2012; Hardlines Design Company, 2012).

Dry Dock 3 Caisson Replacement

For the same reasons as those discussed above for the APE for the Berths 11, 12, and 13 Structural Repairs project, the APE for this project is not in an area that is considered sensitive for historic archaeological resources (Weinstein, 2012; Hardlines Design Company, 2012).

3.4.2.2 Architectural Resources

The Portsmouth Naval Shipyard Historic District (PNSY Historic District) was listed in the NRHP in 1977, and its boundaries and period of significance were later expanded in 1996 and 2007. The Shipyard is significant in American engineering, military, architecture, and industry. Historical significance of the PNSY Historic District is based on its association with events and architectural/engineering qualities. The period of significance is from its establishment in 1800 through the end of the Cold War in 1987.

Most of the buildings within the PNSY Historic District were built between the early 1800s and the 1950s and are constructed of brick, stone, or a combination of the two materials (Navy, 2011). Today, the PNSY Historic District contains 116 contributing resources and 11 contributing landscape features and covers most of the Shipyard property. These features were identified in the 2014 *Survey of Landscape Features at Portsmouth Naval Shipyard* (see Figure 3.4-1) (Hardlines Design Company 2014).

Culturally significant architectural resources in the APEs are discussed below.

Berths 11, 12, and 13 Structural Repairs

Historic properties in the APE for Berths 11, 12, and 13 structural repairs include Dry Docks 1 and 3; Building 175; WH 3; Berths 11 (A, B, and C), 12, and 13 (A and B); and the historic crane and railroad system (including the historic crane rails) along these berths. A portion of Buildings 2, 92, 155 (scheduled for demolition), and 347, as well as Berth 1 also are included.

- **Dry Dock 1** is located at the southeast end of the fitting-out pier, south of Dry Dock 3. Dry Dock 1 was built on the site of the Shipyard's first dry dock, the 1850s floating dry dock that was removed in 1907, when Dry Dock 2 was constructed to the east. Originally used for submarine repairs and construction, the dry dock was constructed by Aberthaw Co. of Boston in 1943 from standard yard and dock designs developed by the U.S. Navy Bureau of Yards and Docks. Like Dry Dock 3, it was constructed in response to the demand for submarine repair and construction facilities during World War II (Navy, 2006b). Dry Dock 1 is 441 feet long, 104 feet wide, and 31 feet deep and is closed at the lower end by a steel caisson maneuvered in and out of place by a barge-mounted crane. Three service galleries extend the length of each side of the dry dock (Louis Berger Group, Inc., 2005d). Dry Dock 1 has retained the earlier structure's numerical designation; it retains integrity of design, workmanship, and materials. Dry Dock 1 is considered a contributing resource within the NRHP-eligible PNSY Historic District under NRHP Criterion C (Navy, 2007; Louis Berger Group, Inc., 2005d).
- **Dry Dock 3** is located at the northeast end of the fitting-out pier. It is 486 feet long, 71 feet wide, and 37 feet deep. Originally used for submarine repairs and construction, the dry dock was constructed by Aberthaw Co. of Boston in 1943 from standard yard and dock designs developed by the U.S. Navy Bureau of Yards and Docks. It was constructed in response to the demand for submarine repair and construction facilities during World War II. The dry dock is still used for submarine repairs and is capable of overhauling both *Virginia* and *Los Angeles* class submarines (Navy, 2006b). Dry Dock 3 contains six service galleries to provide working accommodations for yard workers. At the seaward end, a large steel caisson and its concrete caisson seats form an air-tight seal, allowing submarine repair work to be performed at the dry dock. The existing *circa*1960 caisson is a character-defining feature of the dry dock. The dry dock walls are constructed of a massive concrete facing cast against stay-in-place steel sheet-pile cells. The floor is reinforced concrete supported on bedrock. The appearance of the dry dock is industrial and is representative of the construction that took place at the Shipyard in response to the United States' involvement in World War II. In 1958, Dry Dock 3 was lengthened to accommodate the Navy's larger, modern submarines, and a concrete platform on the north side was widened to provide more working and crane-track space; these alterations were integral for the Shipyard to meet its mission requirements during the Cold War. Additional repair projects that have been completed on the dry dock over the past 55 years include upgrades to pumping and utilities systems and replacement of the stairs and concrete spall repairs throughout the dry dock. Dry Dock 3 retains integrity of design, workmanship, and materials. It is considered a contributing resource within the NRHP-eligible PNSY Historic District under NRHP Criterion C (Appledore Maine Engineering, LLC, 2015; Louis Berger Group, Inc., 2005e; Navy, 2006b, 2007).
- **Building 175,** located to the east of Dry Dock 3, was one of two nearly identical concrete substations constructed in 1941; it is considered a contributing resource within the NRHP-eligible PNSY Historic District under NRHP Criterion C. It was designed by the U.S. Navy Bureau

of Yards and Docks and constructed by Aberthaw Co. of Boston (Louis Berger Group, Inc., 2005f). This windowless building's massive reinforced concrete walls and vaulted ceiling were intended to protect its contents from bomb splinters in the event of an air attack. Building 175 has elements of the Streamline Moderne Style of the 1930s and 1940s, expressed in the grooves below the parapets, the rounded corners of the roofs over the doors, and the shaped covers over the ventilation openings. Steel rings, which were used to support camouflage netting, circumscribe the building at the parapet level. Building 175 is essentially unaltered (Navy, 2006b; Louis Berger Group, Inc., 2005f).

- **WH 3,** located east of and directly adjacent to Dry Dock 3, was constructed in 1943 to serve as the welding house for Dry Dock 3. WH 3 is a contributing resource within the NRHP-eligible PNSY Historic District (Navy, 2007).
- **Berth 11 (A, B, and C),** located to the south of Dry Dock 3, was constructed circa 1942 to form part of the new fitting-out pier. It is integral to the structure of the fitting-out pier, functioning as a retaining wall for the fill that makes up the pier (Navy, 2006b). This structure is made of poured concrete that is now covered by a wood deck (Hardlines Design Company, 2012). While the berth was altered in the 1960s, it retains integrity with respect to design, workmanship, and materials (Louis Berger Group, Inc., 2005a). This berth is a contributing resource within the NRHP-eligible PNSY Historic District under Criterion C (Hardlines Design Company, 2012; Louis Berger Group, Inc. 2005a; Navy 2007).
- **Berth 12**, located to the southwest of Dry Dock 3, was constructed circa 1942 to form part of the new fitting-out pier. A portion of this berth is located within the APE. It is integral to the structure of the fitting-out pier, functioning as a retaining wall for the fill that makes up the pier (Navy, 2006b). Berth 12 is a poured-concrete structure that is now covered by a wood deck (Hardlines Design Company, 2012). While this berth was altered in the 1960s, it retains integrity with respect to design, workmanship, and materials (Louis Berger Group, Inc., 2005b). Berth 12 is a contributing resource within the NRHP-eligible PNSY Historic District under Criterion C (Navy, 2007).
- **Berth 13 (A and B)**, located west of and directly adjacent to Dry Dock 3, also was constructed circa 1942 to form part of the new fitting-out pier. It is integral to the structure of the fitting-out pier, functioning as a retaining wall for the fill that makes up the pier (Navy, 2006b). Berth 13 is a poured-concrete structure that is now covered by a wood deck (Hardlines Design Company, 2012). Similar to Berths 11 and 12, this berth was altered in the 1960s but retains integrity with respect to design, workmanship, and materials (Louis Berger Group, Inc., 2005c). Berth 13 is a contributing resource within the NRHP-eligible PNSY Historic District under Criterion C (Navy, 2007).

Berths 11, 12, and 13 have all been determined to be eligible for the NRHP and are contributing elements to the NRHP-eligible PNSY Historic District under Criterion C (Navy, 2007). These berths are integral structures to the shape and function of the fitting-out pier.

The three berths in combination form the faces of the fitting-out pier. The fitting-out pier with its associated buildings and berths was constructed to support construction of new submarines in the early 1940s during World War II (Navy, 2004a). It was constructed as an expansion of the already-filled timber basin on Dennett's Island and the small, uninhabitable Pumpkin Island to the west (Navy, 2004a; Navy, 2006b; Louis Berger Group, Inc. 2005a). The timber basin area previously served as a stone timber dock for more than 100 years, beginning shortly after the establishment of the Shipyard in 1800. The timber

basin was slowly filled beginning around 1914, creating newly made land, which then was further expanded to encapsulate Pumpkin Island and form the fitting-out pier (Fulk, 2011). The fitting-out pier as a whole is not eligible for the NRHP, although many of its components are.

The fitting-out pier consists of an earth-filled area enclosed along the perimeter with a pile-supported open wharf structure to form Berths 11, 12, and 13.. Steel pipe bollards are embedded in the top of each berth for mooring (Survey of Landscape Features at Portsmouth Naval Shipyard). Originally constructed in 1943, the pier has been expanded, strengthened, and rehabilitated at various times up to the present. Concrete pile platforms and timber fender systems were subsequently added to each of the berths during the 1960s (Louis Berger Group, Inc., 2005a, 2005b, 2005c). In the 1970s, the berths were modified to accommodate the current, larger-gauge portal crane rails. The face of the wharf at Berth 11 (B and C) and Berth 13B has been extended through the installation of a master pile fender system and timber deck. Repairs have generally consisted of installing concrete pile jackets, repairing concrete encasements on steel beams and pile caps, and strengthening all rail beams. As discussed in the 2006 *Architectural Resources Survey*, "this V-shaped mass, totaling about 12 acres in extent, is edged by a concrete quay wall on steel girders that provides over 2,000 linear feet of berthing space" (Navy, 2006b). Berths 11-13 are integral to the structure of the pier, functioning as retaining walls for the fill that made up the pier (Navy, 2006b). The expansion of the Shipyard, including the fitting-out pier, during World War II was essential to the Shipyard's mission (Louis Berger Group, Inc., 2005a).

The fitting-out pier is heavily used and is fully paved; it also contains roadways, as well as rail tracks, for the Shipyard's portal cranes. The historic crane and railroad system, located on the fitting-out pier as well as throughout the Shipyard, is another culturally significant structure within the APE and is described below.

- The **Shipyard railroad and crane system** was an important part of the development of the Shipyard during the twentieth century. The shipyard railroad and crane system is composed primarily of steel freight railroad and crane tracks, which in most locations are embedded in asphalt roadways. The railroad system was developed circa 1901 to allow more effective transportation of materials and supplies around the Shipyard. The railroad system is an important reflection of the expansion of PNSY during the years following the 1898 Spanish-American War up through World War II (1901–1945). The current set of portal crane tracks around the dry docks follows the spatial layout of the World War II-era crane tracks and reflects the advances in Shipyard crane technology that helped allow more rapid production of submarines at the Shipyard—one of the Shipyard's major contributions to the war effort. The railroad and crane system layouts have not been significantly altered since World War II, so the railroad and crane system also retains integrity from the Cold War period between 1945 and 1987 (Hardlines Design Company, 2014).

  Most of the freight and crane track has been replaced or rehabilitated in the past 40 years because the system is still in use. The importance of the railroad and crane system is mainly spatial in nature, with these tracks reflecting the interconnected movement of materials and supplies through the Shipyard, as well as crane use for ship repair during the twentieth century. Due to the level of spatial integrity reflecting the design during the period of significance (1901–1987) and its important contributions to the twentieth-century advancement of shipbuilding technology and capabilities at the Shipyard, the railroad and crane system is recommended as eligible for the NRHP as a contributing property in the PNSY Historic District under Criterion A (Hardlines Design Company, 2014).

- **Building 2** is identified as a Production Shop (Insulators)/Electric Substation 1 (1864, 1941, mid-20th century) that was originally constructed as a storehouse adjacent to Building 1 (originally located in a portion of the Building 155 footprint). Building 2 is a Classical Revival-style building with a cross gable, dentilated wood cornice, lunette windows, and several significant wood six-over-six windows. Throughout the years, several non-significant additions have been made and many windows in-filled with brick (Weinstein, 2013). Building 2 is a contributing resource within the NRHP-eligible PNSY Historic District under Criterion C (Louis Berger Group, 2005h).
- **Building 92**, located just east of the fitting-out pier, was constructed in 1905 as a steam engine and steel plant and is now used as a structural shop. Subsequent additions were made in 1939 and 1941. The original brick building is representative of industrial buildings during the Shipyard's major expansion at the turn of the 20th century. Building 92 is a contributing resource within the NRHP-eligible PNSY Historic District under Criterion C (Navy, 2007; Louis Berger Group, 2005i).
- **Building 155**, located southeast of the fitting-out pier, was constructed in 1939 as a pipe shop, with an addition occurring in 1941. Building 155 was functionally designed with flat roofs, a large, full-length monitor for increased interior illumination, and long expanses of windows (currently a late 20th-century fiber glass) on each long elevation. Building 155 is a contributing resource within the NRHP-eligible PNSY Historic District under Criterion C (Navy, 2007; Louis Berger Group, 2005q). Building 155 is scheduled to be demolished as part of Military Construction P-266.
- **Building 347,** located just east of Dry Dock 1, was constructed ca. 1945 as a welding house and is now in use as a condensate pump station for Dry Dock 1. It consists of a wood-frame enclosure over a concrete electrical service chamber that is mostly below ground; only a small part of the concrete chamber protrudes above the pavement surrounding Dry Dock 1. Building 347 is a contributing resource within the NRHP-eligible PNSY Historic District (Hardlines Design Company, 2012).
- **Berth 1** is located along the north side of the flat-iron pier (Fulk, 2011). It was originally constructed in 1904 to form part of the flat-iron pier and was rebuilt in 1943. Approximately 400 feet long, the Berth 1 quay wall is a gravity retaining wall built entirely of cut granite block. The Berth 1 quay wall was capped with concrete coping, installed sometime after 1923 (Navy, 2004a). As noted in the 2012 ICRMP, this berth is not directly involved in ship or marine construction, repair, and overhaul, although is important to the overall function of the Shipyard as a marine facility (Hardlines Design Company, 2012).

  Berth 1 retains integrity of design and materials and survives as an excellent example of a gravity retaining wall, reflecting the high degree of engineering skill, workmanship, and use of quality materials practiced by the Navy. The westernmost section of the pier has recently undergone structural repairs, although these repairs did not adversely affect the historic integrity of the structure; thus, the integrity of this structure is not considered diminished (Navy, 2004a; Navy, 2006b). Berth 1 was recorded in August 2003 under terms of a Memorandum of Agreement among the United States Navy, Portsmouth Naval Shipyard, and the Maine Historic Preservation Officer, in association with the recent work (Navy, 2004a). Berth 1 has been determined a contributing resource within the NRHP-eligible PNSY Historic District (Hardlines Design Company, 2012; Navy, 2007).

Dry Dock 3 Caisson Replacement

Historic properties in the APE for the Dry Dock 3 caisson replacement project include Dry Dock 3, Building 175, WH3, Berth 13, and a portion of Berth 12. As the APE for the Dry Dock 3 caisson replacement project largely overlaps the APE for Berths 11, 12, and 13 structural repairs, a description of each of these resources has been included as part of the preceding discussion.

Traditional Cultural Properties

There are no known traditional properties with spiritual and/or cultural importance to an Indian tribe, ethnic group, or subculture on the installation. The Navy will consult with five federally recognized Native American tribes of Maine: the Aroostook Band of Micmac Indians, the Houlton Band of Maliseet Indians of Maine, the Indian Township Reservation of the Passamaquoddy Tribe of Maine, the Penobscot Tribe of Maine, and the Pleasant Point Reservation of the Passamaquoddy Tribe of Maine (Hardlines Design Company, 2012).

The Navy consults with federally recognized Indian tribes on actions with the potential to significantly affect protected tribal resources, tribal treaty rights, or Indian lands.

3.5 Biological Resources

Biological resources include living, native, or naturalized plant and animal species, and the habitats within which they occur. Plant associations are referred to generally as vegetation, and animal species are referred to generally as wildlife. Habitat can be defined as the resources and conditions present in an area that support a plant or animal. The analysis in this EA focuses on estuarine vegetation and wildlife in the in-water Project area.

The lower Piscataqua River is part of the busy Port of New Hampshire, and estuarine resources in this area are affected by higher ambient noise levels influenced by commercial, military, and recreational vessel traffic. Ambient noise by definition is background noise, and it has no single source or point. Ambient noise varies with location, season, time of day, and frequency. Ambient noise is continuous but with much variability on time scales, ranging from less than 1 second to 1 year (Richardson et al., 1995). Ambient underwater noise in and near the Project area is widely variable over time due to a number of natural and anthropogenic sources. Sources of naturally occurring underwater noise include wind, waves, precipitation, and biological sources (such as shrimp, fish, and cetaceans). There is also human-generated noise from ship or boat traffic and other mechanical means (Hildebrand, 2009). Anthropogenic sources of underwater noise at industrial waterfronts could come from cranes, generators, and other types of mechanized equipment on wharves or the adjacent shoreline.

Underwater noise generated by the level of vessel traffic and industrial activity present in the lower Piscataqua River may be noteworthy. Typical underwater ambient noise levels for bay systems with heavy recreational, commercial, and industrial vessel traffic are expected to range from 113 dB to 155 dB (ICF Jones and Stokes and Illingworth and Rodkin, Inc. 2009). A recent ambient noise study conducted by ESS Group took in-water ambient sound measurements over a one-day duration at Berths 11, 12, and 13 (ESS Group, Inc., 2015). Average broadband ambient underwater noise levels ranged from 52.8 to 80.5 L_{sel} dB re 1µPa with peak readings from passing boats and industrial noise ranging from 79.9 to 103.9 L_{peak} dB re 1µPa (ESS Group, Inc., 2015). While these sound measurements are below what would be expected in areas with heavy vessel traffic, boat traffic was limited on the day of the in-water ambient sound measurements at the berths (three boats passed at a distance greater than 66 yards

from the site), and the measurements were taken over a short duration. Therefore, typical underwater ambient noise levels in the vicinity of the Shipyard are expected to be higher than these measurements during periods of greater vessel traffic. By virtue of their continued use of this area, aquatic wildlife are considered tolerant of existing anthropogenic activities and ambient underwater noise.

3.5.1 Regulatory Setting

Special-status marine species are those species listed as threatened or endangered under the Endangered Species Act (ESA) and species afforded federal protection under the Marine Mammal Protection Act (MMPA).

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the ESA requires action proponents to consult with the USFWS or NOAA Fisheries to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species or result in the destruction or adverse modification of designated critical habitat. Critical habitat cannot be designated on any areas owned, controlled, or designated for use by the DOD where an Integrated Natural Resources Management Plan has been developed that, as determined by the Department of Interior or Department of Commerce Secretary, provides a benefit to the species subject to critical habitat designation.

All marine mammals are protected under the provisions of the MMPA, which prohibits any person or vessel from “taking” marine mammals in the United States or the high seas without authorization.

The Magnuson-Stevens Fishery Conservation and Management Act provides for the conservation and management of fisheries. Under the Magnuson-Stevens Fishery Conservation and Management Act, EFH consists of the waters and substrate needed by fish to spawn, breed, feed, or grow to maturity.

The CZMA establishes a federal-state partnership to provide for the comprehensive management of coastal resources. Coastal states and territories develop management programs based on enforceable policies and mechanisms to balance resource protection and coastal development needs. Actions implemented on federal lands must ensure consistency with these plans and programs to the maximum extent practicable.

The Maine NRPA contains rules pertaining to the protection of significant natural resources. Under the NRPA, a permit is required for any activity that takes place in, on, or over a significant wildlife habitat, or adjacent to or within 75 feet of a significant wildlife habitat contained within a freshwater wetland.

3.5.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under biological resources.

3.5.2.1 Marine Vegetation

Marine vegetation includes plants occurring in marine or estuarine waters. These may include mangroves, algae, and various grasses.

The Piscataqua River serves as important habitat for aquatic vegetation, including eel grass (*Zostera marina*), which is a submerged, marine flowering plant that is vital to the health and productivity of the estuary. Based on information from the Maine Department of Marine Resources (MEDMR), eel grass

beds have been noted around the Shipyard—specifically, along the northeastern shoreline and in the vicinity of the shoreline along Building 178 (see Figure 3.5-1) (MEDMR, 2005).

In 2014, video and benthic grab surveys were conducted in the Project area along Berths 11, 12, and 13 to characterize bottom substrate, identify epifaunal macroinvertebrate communities, and determine the presence of submerged aquatic vegetation. Figure 3.5-2 shows benthic survey locations in the Project area. The surveys found that the benthic environment alongside the berths was dominated by communities of small opportunistic species indicative of stressed environments, not unlike communities in other regions of the Piscataqua River estuary that exhibit similar stressed conditions. The marine algal species identified included sea lettuce (*Ulva lactuca*), kelp (*Laminaria stenopylla*), rock weed (*Ascophylum nodosum*), and branching red algae (*Rhodophyta* spp.). The surveys found no presence of eel grass within or near the Project area. No other marine plant species were identified (CR Environmental, Inc., 2014). The 2014 benthic survey report is included with the EFH assessment for the proposed action in Appendix G.

3.5.2.2 Marine Mammals

Jurisdiction over marine mammals is maintained by NOAA Fisheries and the USFWS. NOAA Fisheries maintains jurisdiction over whales, dolphins, porpoises, seals, and sea lions. The USFWS maintains jurisdiction for certain other marine mammal species, including walruses, polar bears, dugongs, sea otters, and manatees. The MMPA of 1972 prohibits the “take” of marine mammals in U.S. waters. A take is defined under the MMPA as “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal” and includes “any negligent or intentional act which results in disturbing or molesting a marine mammal.”

In general, the occurrence of marine mammals in the lower Piscataqua River is rare, and they are more prevalent off the coasts of Maine and New Hampshire; however, seals and cetaceans occasionally occur in the lower Piscataqua while foraging (Smith, n.d.). Table 3.5-1 lists the marine mammals potentially occurring in the Project area. Seal species that could occur include the harbor seal (*Phoca vitulina*), grey seal (*Halichoerus grypus*), hooded seal (*Cystophora cristata*), and harp seal (*Pagophilus groenlandicus*). There is one known seal haul-out site located approximately 1.5 miles downstream of the Project Area. Of the seal species, the harbor seal is the most likely to occur in the Project area. Cetacean species that could occur in the Project area include the harbor porpoise (*Phocoena phocoena*), which occurs occasionally in the lower Piscataqua River (Smith, n.d.). Descriptions of each of these species, including their habitat and geographic ranges and expected abundance near the Project area, are provided in Appendix F. Additionally, there are some reports of offshore marine mammals occurring within the river, though these occurrences are extremely rare (Smith, n.d.). There are no known significant populations of marine mammals and no federally listed threatened or endangered marine mammals with the potential to occur within the Piscataqua River or Back Channel.

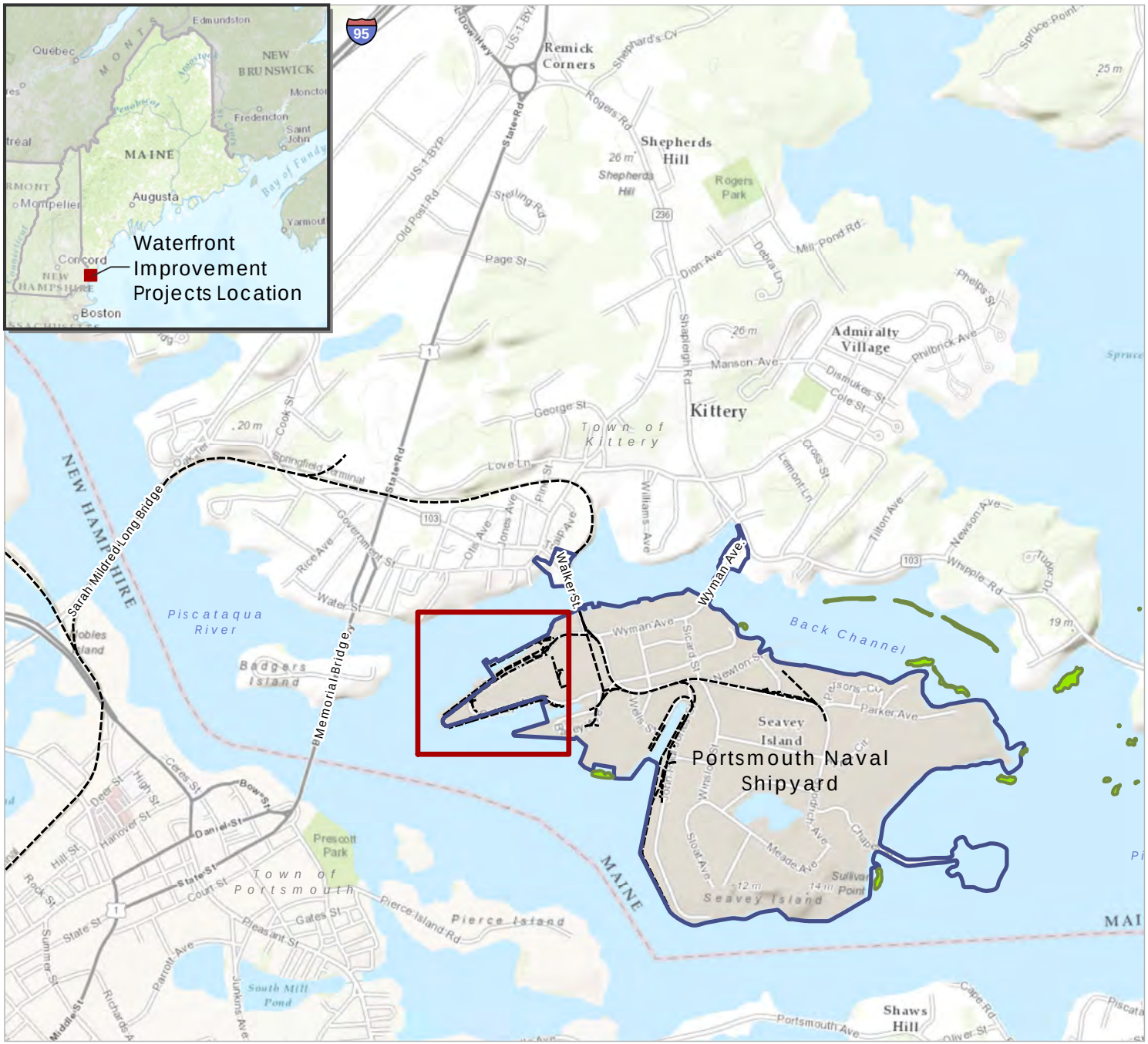

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Figure 3.5-1
Eelgrass Beds
Portsmouth Naval Shipyard
York County, Maine

Legend

- Project Area
- Installation Area
- Eelgrass Beds
- Railroad

Source: ESRI 2013; Department of Defense 2014; Maine Department of Marine Resources 2010; Maine Department of Transportation 2011.

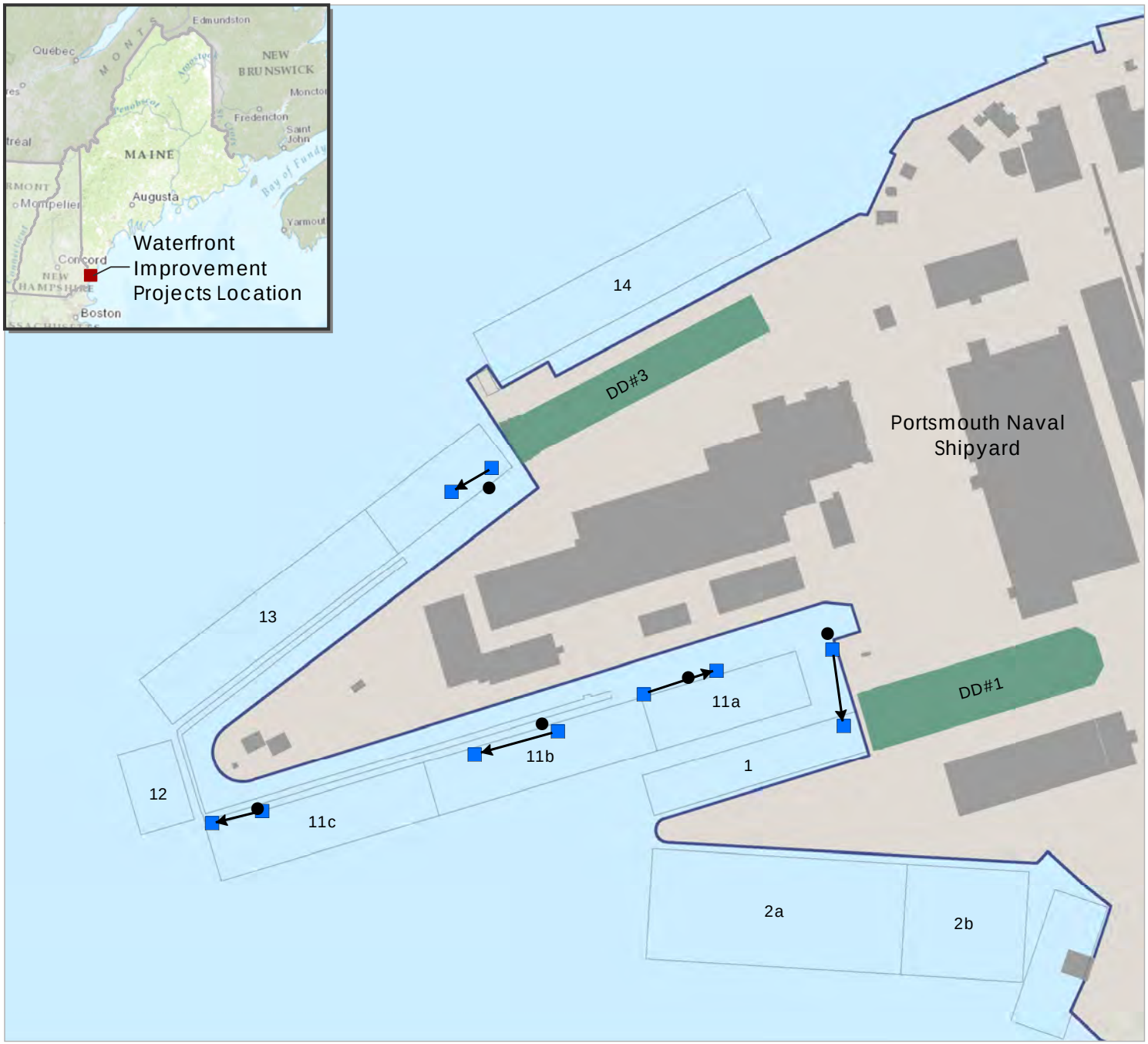

Figure 3.5-2
Benthic Survey Locations
Portsmouth Naval Shipyard
York County, Maine

Legend

- PNSY sediment grab stations 5/13/2014
- PNSY video transects 5/13/2014
- Dry Dock
- Berth
- Existing Structures
- Installation Area

N

0 100 200 300 400 Feet

Source: CR Environmental 2014; ESRI 2013; Department of Defense 2014.

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Table 3.5-1 Marine Mammal Species Potentially Occurring in the Piscataqua River Near Portsmouth Naval Shipyard

Species	*Stock(s') Abundance*[(1)]	*Relative Occurrence in Lower Piscataqua River*	*Season(s) of Occurrence*	*Approximate Density in the Vicinity of the Project Area (individuals per km²)* [(3)]			
				Winter	*Spring*	*Summer*	*Fall*
Harbor Porpoise (*Phocoena phocoena*) Gulf of Maine/Bay of Fundy stock	79,883 (CV= 0.32)	Occasional	Spring to Fall (April to December)	1.2122[4]	1.1705	0.7903	0.9125
Grey Seal (*Halichoerus grypus*) Western North Atlantic stock	331,000 [(2)]	Common	Year-round	0.2202	0.2202	0.2202	0.2202
Harbor Seal (*Phoca vitulina*) Western North Atlantic stock	70,142 (CV= 0.29)	Common	Year-round	0.1998	0.1998	0.1998	0.1998
Hooded Seal (*Crystphora cristata*) Western North Atlantic stock	592,900 [(2)]	Rare	Winter to Spring (January – May)	N/A	N/A	N/A	N/A
Harp Seal (*Pagophilus groenlandicus*) Western North Atlantic stock	71,000,000	Rare	Winter to Spring (January – May)	0.0125	0.0125	0.0125	0.0125

Source: Waring et al. 2014, except where noted.

Notes:

1 No population estimate is available for the U.S. Western North Atlantic stock; therefore, the best population estimates are those for the Canadian populations, as reported in Waring et al. 2014.

2 Source: Waring et al. 2007. The population estimate for the Western North Atlantic hooded seal population was not updated in Waring et al. 2014.

3 Density data are taken from the Navy Marine Species Density Database (Crain 2015; Krause 2015). It should be noted that these data overestimate the potential species density in the Piscataqua River. The Navy Marine Species Density Database data presented in the table are based on a relative environmental suitability study and represent data with low confidence. These data are generally used for broad-scale offshore activities; however, due to a lack of any other data within the general Project area, these data are presented as the best available data for the Piscataqua River.

4 The species is not expected to be present in the river during this season. As noted above, density data are taken from the Navy Marine Species Density Database and overestimate the potential species density in the Piscataqua River.

Key:
CV = coefficient of variation
km^2 = square kilometer

3.5.2.3 Fish

Fish are a vital component of the marine ecosystem and have great ecological and economic values. To protect this resource, NOAA Fisheries works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. EFH has been described for approximately 1,000 managed species to date. EFH includes all types of aquatic habitat including wetlands, coral reefs, seagrasses, and rivers—all locations where fish spawn, breed, feed, or grow to maturity.

The Piscataqua River, Back Channel, and Portsmouth Harbor support diverse, abundant populations of fish. Nine species of anadromous fish migrate through the Piscataqua River, including the federally endangered shortnose sturgeon (*Acipenser brevirostrum*) and federally threatened Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). American shad (*Alosa sapidissima*) and striped bass (*Morone saxatilis*) are seasonal inhabitants of nearshore waters surrounding the Project area. Alewife (*Alosa pseudoharengus*), Atlantic silverside (*Menidia menidia*), Atlantic menhaden (*Brevoortia tyrannus*), blueback herring (*Alosa aestivalis*), and rainbow smelt (*Osmerus mordax*) are some of the most abundant finfish species found in the Piscataqua River system. These species represent important components of the forage base for larger predatory fish.

Significant numbers of finfish are year-round residents of the Piscataqua River and Back Channel, including Atlantic tomcod (*Microgadus tomcod*), cunner (*Tautogolabrus adspersus*), grubby (*Myoxocephalus aenaeus*), lumpfish (*Cyclopterus lumpus*), mummichog (*Fundulus heteroclitus*), northern searobin (*Prionotus carolinus*), northern pipefish (*Syngnathus focus*), rock gunnel (*Pholis gunnellus*), smooth flounder (*Pleuronectes putnami*), stickleback (*Gasterosteidae* spp.), and winter flounder (*Pseudopleuronectes americanus*). Major predators in the area include striped bass, bluefish (*Pomatomus saltatrix*), Atlantic tomcod, out-migrating juvenile Atlantic salmon (*Salmo salar*), and American eel (*Anguilla rostrata*). Recreational fishing in Portsmouth Harbor and the Piscataqua River is primarily directed toward American shad, Atlantic tomcod, bluefish, pollock (*Pollachius* spp.), rainbow smelt, sea-run brown trout (*Salmo trutta*), striped bass, white perch (*Morone americana*), and winter flounder (Garman and Harris, 1995).

Table 3.5-2 lists fish species known to occur in the Project area for which the New England Fishery Management Council, the Mid-Atlantic Fishery Management Council, South Atlantic Fishery Management Council, and the NOAA Fisheries' Northeast Regional Office (now the Greater Atlantic Regional Fisheries Office) have designated EFH. NOAA Fisheries' EFH Mapper was cross-referenced with the species list of fish occurring in the Great Bay National Wildlife Refuge, which is located approximately 10 miles upriver from the Project area, to develop a list of species in the vicinity of the Project area with designated EFH (see Table 3.5-2).

Table 3.5-2 Species with Designated Essential Fish Habitat near Portsmouth Naval Shipyard

Species		*Eggs*	*Larvae*	*Juveniles*	*Adult*	*Spawning Adults*
Common Name	***Scientific Name***					
Atlantic salmon	*Salmo salar*			X	X	
Atlantic cod	*Gadus morhua*	X*	X*	X	X	
Haddock	*Melanogrammus aeglefinus*	X*	X*			
Pollock	*Pollachius virens*	X*	X*	X*	X	
Whiting	*Merluccius bilinearis*			X	X	
Red hake	*Urophycis chuss*	X	X	X*	X*	
White hake	*Urophycis tenuis*	X*	X	X*	X*	

Table 3.5-2 Species with Designated Essential Fish Habitat near Portsmouth Naval Shipyard

Species		*Eggs*	*Larvae*	*Juveniles*	*Adult*	*Spawning Adults*
Common Name	***Scientific Name***					
Winter flounder	*Pseudopleuronectes americanus*	X*	X*	X*	X*	X*
Yellowtail flounder	*Limanda ferruginea*	X*	X*		X	
Windowpane flounder	*Scophthalmus aquosus*	X*	X*	X*	X*	X*
American plaice	*Hippoglossoides platessoides*				X	
Atlantic halibut	*Hippoglossus hippoglossus*	X*	X*	X*	X*	X*
Atlantic sea scallop	*Placopecten magellanicus*	X	X	X*	X*	
Atlantic sea herring	*Clupea harengus*		X*	X*	X	
Bluefish	*Pomatomus saltarix*			X*	X*	
Atlantic mackerel	*Scomber scombrus*	X*	X*	X*		
Atlantic bluefin tuna	*Thunnus thynnus*				X	

Source: NOAA Fisheries Service, Greater Atlantic Regional Fisheries (GARFO) n.d.[a] and n.d.[b]

Note:
X = EFH is present in the Project area for this life stage.
* Indicates that EFH is designated for those species/life stages in the seawater zone portion of the Great Bay estuary.

3.5.2.4 Benthic Invertebrates

Benthic invertebrates inhabit the seafloor and include a variety of diverse groups, from sessile species (i.e., animals permanently attached to the seafloor or a structure) such as sponges, corals, and bivalves to motile crustaceans such as crabs, shrimp, and lobsters. American lobster (*Homarus americanus*), eastern oyster (*Crassostrea virginica*), blue mussel (*Mytilus edulis*), green crab (*Carcinus maenas*), rock crab (*Cancer irroratus*), and soft-shell clam (*Mya arenaria*) abound in the estuary. Recreational fishing in Portsmouth Harbor and the Piscataqua River is primarily directed toward lobster, oyster, and soft-shell clam (Garman and Harris, 1995).

Common invertebrates found during the 2014 benthic grab and video surveys included sand shrimp (*Crangon crangon*) in areas sheltered from strong currents, sea stars (*Asteria vulgaris*) and blue mussels (*Mytilus edulis*) in areas exposed to stronger currents, and other species common to Maine waters such as the branched hydroid (*Hydroza* spp.), orange sheath tunicate (*Botrylloides violaceaus*), sea anemone (*Metridum senle*), Jonah crab (*Cancer borealis*) and rock crab. No rare, threatened, endangered, or otherwise distinctive species were observed. (CR Environmental, Inc., 2014)

3.5.2.5 Threatened and Endangered Species

The purpose of the ESA is to protect and recover any listed threatened and/or endangered species and their habitats. Like the MMPA, the ESA prohibits the take (without a permit) of any listed species. Section 7 of the ESA requires consultation with the USFWS and/or NOAA Fisheries for any action that "may affect" a federally listed threatened or endangered species. The protection of non-federally listed species that are listed at the state level as threatened or endangered is not legally mandated; however, the Navy cooperates with state agencies to protect such species whenever possible (Office of the Chief of Naval Operations Instruction 5090.1C).

The 125 endangered and threatened marine species over which NOAA Fisheries has jurisdiction were reviewed to determine their potential occurrence in the Project area. Two species, the Atlantic sturgeon and shortnose sturgeon, could occur in the Project area. A third fish species, the Atlantic salmon, and

the four federally protected sea turtle species could potentially occur but are unlikely to because of a lack of suitable habitat in the Project area.

An anadromous species, the Atlantic salmon is drawn upriver to breeding habitat substrates consisting of gravel or cobble riffles, specifically associated with shallow estuaries (NEFMC, 1998). Although EFH for the Atlantic salmon has been identified in the Project area (NOAA Fisheries Service, 2014, n.d.), the Project area does not exhibit these habitat types and is not within designated critical habitat for the species. The nearest critical habitat for the Atlantic salmon to the Project area is in perennial rivers, streams, estuaries, and lakes located approximately 50 miles north of the Shipyard. Historically, the species ranged from Quebec to Newfoundland and south to Long Island Sound, including the Piscataqua River; however, the Atlantic salmon's current range is limited to 11 rivers, not including the Piscataqua. Therefore, the Atlantic salmon is not expected to occur in the Project area or its vicinity. The Navy has determined the Proposed Action would have no effect on the Atlantic salmon, and the species is not discussed further in this EA.

Four sea turtle species could potentially occur in Maine estuarine waters include the leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and hawksbill (*Eretmochelyd imbricate*) turtles. While each species varies slightly in its nesting locations, they share a common pattern wherein they migrate south to warmer waters to nest and north into cooler waters to feed. During their northern migrations, sea turtles are largely carried by oceanic currents with the Gulf of Maine beyond the northernmost extent of their typical migratory patterns. In addition, with the exception of the leatherback, sea turtles are very sensitive to cold waters and prefer habitats consisting of pelagic waters, sandy beaches, or benthic environments abundant in sea grasses and algae (NOAA Fisheries Service, 2015). The distance of the lower Piscataqua River from suitable habitats, the lack of abundant food sources, and cold water temperatures make occurrences of sea turtles in Maine waters extremely rare. Therefore, the Navy has determined the Proposed Action would have no effect on these species, and they are not discussed further in this EA.

1. Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

Status and Management

NMFS was petitioned to list the Atlantic sturgeon under the ESA in 2009. In 2010, NMFS found that the petition presented substantial scientific or commercial information indicating that listing may be warranted (FR 75 [3]: 838-841, January 6, 2010). After completing an ESA status review of the Atlantic sturgeon, NMFS issued two Final Rules on February 6, 2012—one for the Southeast Region, listing the Carolina and South Atlantic distinct population segments as endangered (FR 77 [24]: 5914-5982, February 6, 2012), and the other for the Northeast Region, listing the Gulf of Maine distinct population segment as threatened and the Chesapeake and New York Bight distinct population segments as endangered (FR 77 [24]: 5880-5912, February 6, 2012). NMFS has not designated critical habitat for the Atlantic sturgeon.

The Atlantic sturgeon is also managed under a fishery management plan implemented by the Atlantic States Marine Fisheries Commission, but a coast-wide moratorium on its harvest is in effect (Greene et al., 2009). NMFS augmented the Atlantic States Marine Fisheries Commission moratorium with a similar moratorium for federal waters. Amendment 1 to the Atlantic States Marine Fisheries Commission's Atlantic Sturgeon Fishery Management Plan also includes measures for preservation of existing habitat, habitat restoration and improvement, monitoring of bycatch and stock recovery, and breeding and stocking protocols (FR 75 [3]: 838-841, January 6, 2010).

Habitat and Geographic Range

As an anadromous fish, mature Atlantic sturgeon undergo seasonal migrations between freshwater habitats, where they spawn, and marine waters, where they forage and grow. During nonspawning years, adults remain in marine waters either year-round or seasonally (Bain, 1997). Spawning adults migrate upriver in spring, beginning in February in the south, April in the mid-Atlantic, and May in Canadian waters (Dadswell, 2006). Beginning in mid-May, after water temperatures have reached 14.8° to 19.0° Celsius (°C), Atlantic sturgeon will travel up large New England rivers (Collette and Klein-MacPhee, 2002). After spawning in freshwater in the spring and early summer, adults migrate back into estuarine and marine waters. Spawning populations of the Gulf of Maine distinct population segment are found in the Kennebec River, and potentially in the Penobscot River; the Piscataqua River is not a spawning river. After spawning, females return to the sea within 4 to 6 weeks, while males may remain in the river or lower estuary until fall (Murdy et al., 1997; NOAA NMFS, 2010). Tagging data indicate that immature Atlantic sturgeon disperse widely once they move into coastal waters (Secor et al., 2000). Dispersal is extensive: north and south along the Atlantic coast and seaward to the edge of the Continental Shelf (Bain, 1997). Atlantic sturgeon juveniles in the Northeast U.S. Continental Shelf and Scotian Shelf Large Marine Ecosystems may occur in salinities ranging from 5 to 25 parts per thousand in estuaries, usually over a mud-sand bottom (Dadswell, 2006). Juveniles move between estuaries and the ocean (NOAA Fisheries Office of Protected Resources, n.d. [a]), while sub-adults and adults live in coastal waters and estuaries when not spawning, generally in shallow (35 to 165 feet deep) inshore areas of the Continental Shelf where they feed (FR 75 [3]: 838-841, January 6, 2010). In a 2004 study using fisheries bycatch data, Atlantic sturgeon were found to be strongly associated with specific coastal areas, such as the mouths of Narragansett Bay and Chesapeake Bay and the inlets of the North Carolina Outer Banks; most fish were caught within a narrow range of depths (30 to 160 feet) over gravel and sand, and to lesser extent, silt and clay (Stein et al., 2004).

Population and Abundance

Between seven and 10 genetically distinct populations along the U.S. Atlantic coast can be statistically differentiated (Stein et al., 2004). Abundance estimates are available for only two of these populations—the Hudson River (New York) population (9,500 juveniles) and the Altamaha River (Georgia) population (2,000 sub-adults)—although these data are from 1995 (National Marine Fisheries Service, 2010). The mean annual spawning stock size has been estimated at 870 individuals, although about half of the Hudson River population may be of hatchery origin (National Marine Fisheries Service, 2007). The Altamaha River supports one of the healthiest Atlantic sturgeon populations in the southeast, which appears to be stable (Peterson et al., 2008). The status of the other Atlantic sturgeon populations varies widely, from the large but possibly declining Hudson River population, to small groups of survivors of a once robust population that has undergone considerable decline (Delaware River), to apparently locally extinct populations (Maryland tributaries of Chesapeake Bay and St. Johns River, Florida) (National Marine Fisheries Service, 2007; Waldman and Wirgin, 1998).

The two extant populations of the Gulf of Maine distinct population segment are the Penobscot and Kennebec River populations. Analysis of these two populations has determined that there is a moderate risk of the distinct population segment becoming endangered over a 20-year planning horizon (NOAA NMFS 210). The Penobscot subpopulation is thought to have fewer than 300 spawning adults. The Kennebec River population historically supported approximately 15,000 spawning adults, and limited data suggest that the population may be increasing (NOAA NMFS 2010).

Predator and Prey Interactions

Like all sturgeon, the Atlantic sturgeon feeds along the bottom on invertebrates such as isopods, crustaceans, worms, and molluscs (NOAA NMFS, 2010). It has also been documented to feed on fish (Bain, 1997). Evidence of predation on sturgeon is scarce, but some researchers believe they are taken by the American alligator (*Alligator mississippiensis*), alligator gar (*Atractosteus spatula*), and striped bass (*Morone saxatilis*) (Dadswell, 2006). Sharks likely prey on all species of sturgeon in the marine environment (NOAA NMFS, 1998a).

Species-specific Threats

Historical overfishing resulted in declines in Atlantic sturgeon abundance. Atlantic sturgeon bycatch is the most substantial threat in the ocean environment (NOAA NMFS 2010). Other threats include the marine parasitic copepod (*Dichelesthium oblongum*), which has been observed on up to 93 percent of the sturgeon sampled in the New York Bight during 2007 and 2008. Substantially higher parasite burdens, stress, and reduced physiological condition associated with Atlantic sturgeon in areas of sewage contamination may have negative impacts on juvenile Atlantic sturgeon (Fast et al., 2009). Vessel strikes (Brown and Murphy, 2010) and degraded water quality (Collins et al., 2000) have also been noted as threats to this species.

Presence in the Project Area

Historically, Atlantic sturgeon were common in the Great Bay estuary, including the Piscataqua River (Odell et al., 2006). Adults overwinter in pelagic areas and would not be found in the Project area during winter months; however, subadults may overwinter in estuarine and marine waters. Therefore, Atlantic sturgeon could occur within the Project area year-round (Tritt, 2014). Currently, there is no evidence to suggest that the Piscataqua River is used as spawning ground by Atlantic sturgeon, but subadults use the Great Bay estuary system (including the lower portions of the Piscataqua River) as nursery habitat (NOAA NMFS, 1998b). The Navy has been partnering with the USGS since February 2014 to capture, tag and monitor sturgeon populations in the Piscataqua River estuary. There have been no detections of tagged Atlantic sturgeon near the Shipyard. Further, the Navy is actively monitoring for the presence of tagged sturgeon at the Shipyard and will continue efforts for at least the next 10 years.

2. Shortnose Sturgeon (*Acipenser brevirostrum*)

Status and Management

In 1967, the shortnose sturgeon was listed as endangered under the Endangered Species Preservation Act of 1966, which predated the ESA; this species remains on the list as endangered throughout its range along the Atlantic coast (NOAA NMFS, 1998a). No critical habitat has been designated for this species.

NMFS manages 19 distinct population segments of the anadromous shortnose sturgeon (NOAA NMFS, 1998a); those occurring in rivers and estuaries along the Atlantic coast are listed below:

- Kennebec River System (including the Sheepscot, Kennebec, and Androscoggin Rivers), Maine
- Hudson River, New York
- Delaware River, Delaware, New Jersey, New York, and Pennsylvania
- Chesapeake Bay and Potomac River, Maryland and Virginia

- St. Marys River, Georgia
- St. Johns River, Florida.

Habitat and Geographic Range

After hatching in upstream reaches of rivers, shortnose sturg eon larvae orient into the river current and away from light sources, generally staying near the bottom and seeking cover. By two weeks of age, the larvae emerge from cover and swim in the water column, moving downstream from the spawning site. By two months, juvenile behavior becomes similar to that of adults, with active swimming in a wide range of thermal conditions (Deslauriers and Kieffer, 2012) and foraging at night along the bottom (Richmond and Kynard, 1995).

The shortnose sturgeon primarily occurs in freshwater rivers and coastal estuaries of the Northeast and Southeast U.S. Continental Shelf large marine ecosystems, occasionally moving short distances to the mouths of estuaries and into nearshore coastal waters (Dadswell, 2006; NOAA NMFS, 1998a). Shortnose sturgeon are known to occur as far north as Saint John River, New Brunswick, Canada, and as far south as Indian River, Florida (NOAA NMFS, 1998a). Shortnose sturgeon are a migratory species influenced by temperature and salinity, tending to prefer warmer temperatures and lower salinity; they tend to migrate between freshwater and mesohaline river reaches (NOAA NMFS, 1998a). In estuarine systems, juveniles and adults occupy areas with little or no current over a bottom composed primarily of mud and sand (Secor et al., 2000). Adults are found in deep water (35 to 100 feet) in winter and in shallow water (7 to 35 feet) during summer (Welsh et al., 2002). Individual shortnose sturgeon do not disperse far along the coastline beyond their home river estuaries (NOAA NMFS, 1998a). Based on this information, the species' potential occurrence is concentrated within the bays and estuaries associated with each distinct population segment. The breeding season from April to June is when the shortnose sturgeon will migrate from its overwintering locations upstream to spawning grounds; migrations occur in the early spring in the species' northernmost ranges and in the late winter/early spring in the southernmost ranges. The spawning period will vary from a few days up to 30 days, determined by a "spawning suitability window" that includes day length, water temperature, and river discharge rates. (NMFS, 2010).

Population and Abundance

No estimate of the historical shortnose sturgeon population size is available (NOAA Fisheries Office of Protected Resources, n.d. [b]). The lack of shortnose sturgeon catches in the 1950s led the USFWS to conclude that the species had been eliminated from rivers in its historical range (except the Hudson River) (NOAA Fisheries Office of Protected Resources, n.d. [b]). Historical trends for abundance have not been conclusive, but there is evidence to suggest a population decline (NOAA Fisheries Office of Protected Resources, n.d. [b]). Certain subpopulations of the shortnose sturgeon have increased substantially in recent years, particularly in the Hudson River (Bain, 1997; Stein et al., 2004). Several strong cohorts had higher-than-expected survival during the 1980s and 1990s, then recovery slowed during the late 1990s (Woodland and Secor, 2007). Abundances in the Hudson River population exceed recovery criteria (Bain et al., 2007; Woodland and Secor, 2007). The Delaware River supports a well-documented population (8,445 individuals) (Welsh et al., 2002), but the abundance of the Chesapeake Bay and Potomac River population is not known.

Populations of shortnose sturgeon are currently found in the Saint John River, Kennebec system, and Merrimac River. There may also be a population in the Penobscot River (Collette and Klein-MacPhee, 2002). The shortnose sturgeon may occur in the lower Piscataqua River and the Project area during the

spring as it migrates to spawning sites and again during fall migration when it heads back out to its overwintering sites (NMFS, 2014). There are no records of shortnose sturgeon spawning in the Piscataqua River (NOAA NMFS, 2010).

Predator and Prey Interactions

Feeding patterns of the shortnose sturgeon vary seasonally between northern and southern river systems. In northern rivers, some sturgeon feed in freshwater during summer and over sand-mud bottoms in the lower estuary during fall, winter, and spring (NOAA NMFS, 1998a). By contrast, in southern rivers, feeding has been observed during winter at or just downstream of where saltwater and freshwater meet (Kynard, 1997). The shortnose sturgeon feeds by suctioning polychaetes (marine worms), crustaceans, molluscs, and small fish from the bottom (NOAA NMFS, 1998a; Stein et al., 2004).

Young-of-the-year sturgeon (individuals less than one year old) have been found in the stomachs of yellow perch (NOAA NMFS, 1998a). Predation on older sturgeon is not well documented, although sharks likely prey on them in the marine environment (NOAA NMFS, 1998a).

Species-Specific Threats

Principal causes of the shortnose sturgeon's decline include pollution, overharvesting in commercial fisheries (including bycatch in the shad fishery), and its resemblance to the formerly commercially valuable Atlantic sturgeon (Bain et al., 2007; NOAA NMFS, 1998a). Other risk factors include poaching (northern rivers); accidental introduction of exotic species into habitat; very low productivity; freshwater spawning and nursery areas destroyed or degraded because of human-caused dissolved oxygen reductions; contaminants (e.g., heavy metals, pesticides, and organochlorine compounds); siltation from dredging, bridge construction, and demolition; impingement on power plant cooling water intake screens; impoundment operations; and hydraulic dredging operations (Collins et al., 2000; NOAA NMFS, 1998a).

Presence in the Project Area

Shortnose sturgeon are found within the Piscataqua River, but their suitable habitat typically includes estuarine areas with lower salinities than the waters present in the Project area. Therefore, while shortnose sturgeon may occur in the Project area during spring and fall migrations between overwintering and spawning sites, they are expected to be transient in the lower Piscataqua River (Tritt, 2014). The Navy has been partnering with the USGS since February 2014 to capture, tag, and monitor sturgeon populations in the Piscataqua River Estuary. There have been no detections of tagged shortnose sturgeon at the Shipyard; however, one was found upstream of the Shipyard in October 2014. The Navy is actively monitoring for the presence of tagged sturgeon at the Shipyard and will continue efforts for at least the next 10 years.

3.6 Visual Resources

This discussion of visual resources includes the natural and built features of the landscape visible from public views that contribute to an area's visual quality. Visual perception is an important component of environmental quality that can be impacted through changes created by various projects. Visual impacts occur as a result of the relationship between people and the physical environment. Public concern over adverse visual impacts can be a major source of project opposition.

Visual resources within the immediate vicinity of the Shipyard were considered; in general, this included only those resources within the viewshed of the Shipyard (i.e., that have a view of the installation).

3.6.1 Regulatory Setting

NEPA requires that the Navy account for environmental resources that may be affected by the Proposed Action. Visual resources are included among those to be considered. Visual resources, including scenic areas, sites, landscapes, or other visual features, can be important at the national, state, or local level.

3.6.2 Affected Environment

The affected environment consists of a number of visually sensitive resources that are located both at and near the Shipyard.

The Shipyard is situated in the lower Piscataqua River, adjacent to Portsmouth Harbor, part of the Great Bay estuary in Maine and New Hampshire, and the Town of Kittery. The Piscataqua River separates the Shipyard from the City of Portsmouth, New Hampshire, while the Back Channel of the Piscataqua River separates the Shipyard from the Town of Kittery. Portsmouth Harbor and the Piscataqua River accommodate heavy recreational, commercial, and military vessel traffic. The Back Channel is used primarily by recreational and commercial fishing boats (see Figure 3.6-1).

As noted in Section 3.4, Cultural Resources, the Shipyard is an active industrial complex associated with military vessel repair and maintenance. The overall setting of the Shipyard is a result of operational functions and architectural design from more than 200 years of physical growth and change. The built environment consists of dense industrial areas interspersed with residential and administrative structures; buildings are irregularly placed and contrast with one another in age, design, scale, and materials.

The majority of the Shipyard is included within the PNSY Historic District, which was established in 1977 and expanded in 1996 and 2006. Since the establishment of the historic district, the built environment of the Shipyard has been modified, consistent with the evolving nature of the Shipyard's mission and its significance as a continually operating Naval shipyard. While these modifications have sometimes altered the setting, the PNSY Historic District is still capable of conveying its sense of time, place, and historical development associated with its periods of significance (Navy, 2006b).

At a local level, the Town of Kittery places value on the visual and scenic quality created by the "interface of the land with the community's waterbodies" due to its coastal position (Kittery Comprehensive Plan Update Committee, 2002). As a result, the town's entire shoreline has been designated as a scenic area. In addition, the Town of Kittery has assigned scenic views and vistas, as well as scenic roads, to one of several different categories of importance (Category 1 being the highest and Category 3 being the lowest) based on their scenic value. For instance, a Category 1 designation means that the Town of Kittery has identified the scenic views/vistas/roads as having one of the highest scenic values to the community. These resources then are considered during any planning process that may affect these values (Kittery Comprehensive Plan Update Committee, 2002).

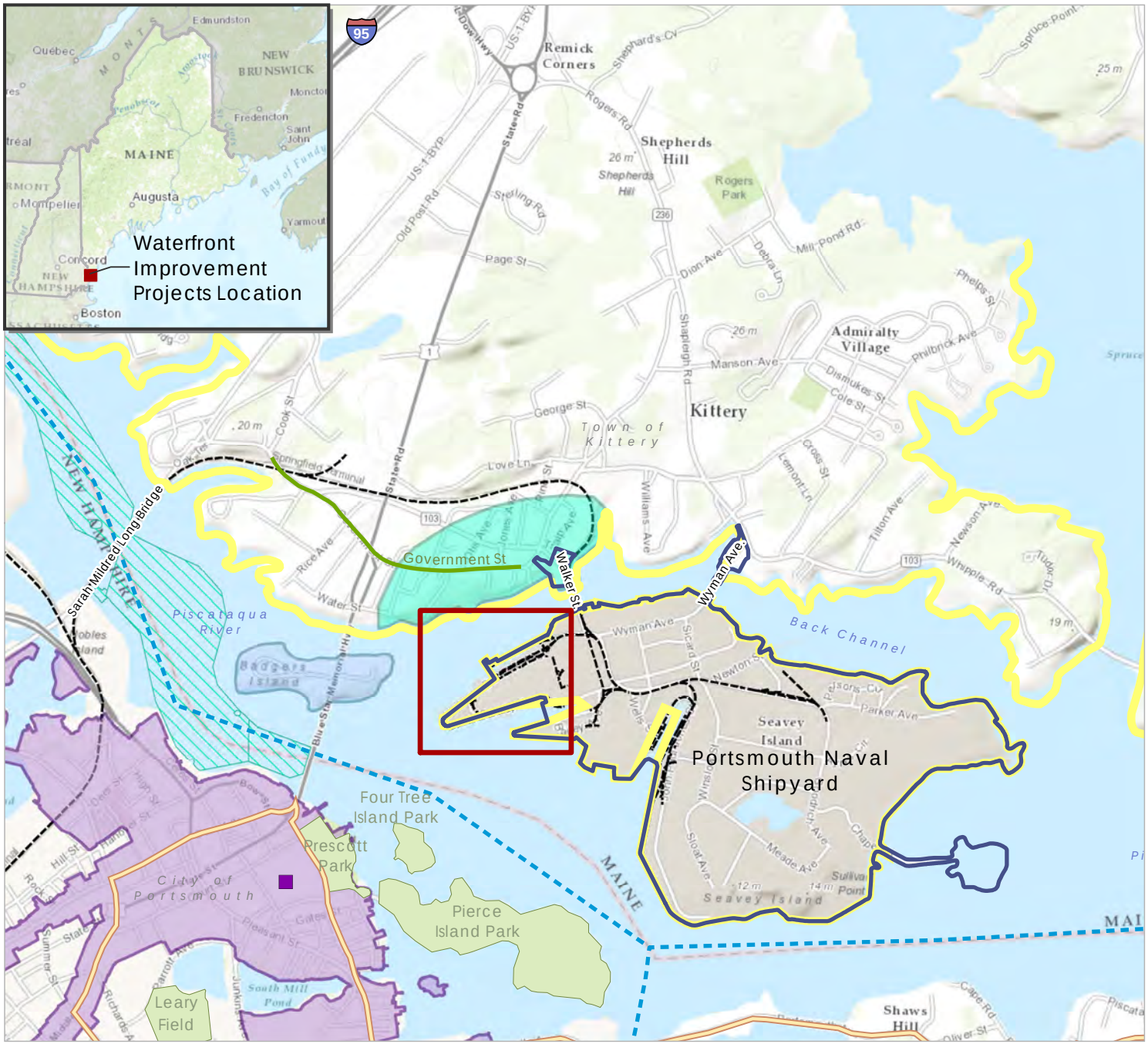


Figure 3.6-1
Visually Sensitive and Scenic Areas
Portsmouth Naval Shipyard
York County, Maine

Legend

- Project Area
- Installation Area
- Navigation Channel
- Navigation Lanes
- Railroad
- Kittery's Shoreline Scenic Area
- Government Street
- Coastal Byway
- Strawbery Banke Museum
- Portsmouth Historic District
- Badgers Island
- Wallingford Square Scenic Area
- Parks

N

0 500 1,000 1,500 2,000 Feet

Source: ESRI 2013; Department of Defense 2014; Maine Department of Transportation 2011.

Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\EA\Figure_3_6_1_VisuallySensitive_ScenicAreas.mxd

The following scenic resources in the Town of Kittery may contain views of the Shipyard due to their locations:

- **The Back Channel of the Piscataqua River** between the Shipyard and the Town of Kittery is used primarily by recreational and commercial fishers.
- **The Piscataqua River** and federal navigation channel (between the Shipyard and the Town of Portsmouth) accommodate heavy recreational, commercial, and military vessel traffic.
- **The Town of Kittery Shoreline Scenic Area** includes the entire shoreline of the town and the Shipyard (Kittery Comprehensive Plan Update Committee, 2002).
- **The Wallingford Square Scenic Area** is on the north side of the Back Channel, across from and to the north of the Shipyard at the fitting-out pier, and is a formally designated scenic resource in the Town of Kittery (Kittery Comprehensive Plan Update Committee, 2002).
- **Badger's Island**, located to the east of the Shipyard, is a designated Scenic Area in the Town of Kittery and also contains a Category 1 Scenic View/Vista (View 1-9, the view of the Back Channel and Kittery Foreside from Badger's Island [180-degree view]) (Kittery Comprehensive Plan Update Committee, 2002).
- **Government Street**, a designated scenic resource in the Town of Kittery, is a Category 1 Scenic Road (Road 1-5) (Kittery Comprehensive Plan Update Committee, 2002).
- The **Kittery Foreside District** is located northwest of the Shipyard. The neighborhood is characterized by a mixture of historic and modern development. One historic architectural resource listed on the NRHP, the Robert and Louisa Traip House, is located in the district on Wentworth Street, just north of the Shipyard, and is visible from the Shipyard. The Greek Revival-style house was erected by Robert Traip, a direct descendent of Kittery's original seventeenth-century settlers, in the 1820s (National Register of Historic Places, n.d.).

The City of Portsmouth, New Hampshire, also considers preservation of scenic landscapes in its planning process, with one of its objectives in its master plan being to preserve scenic views to the waterfront. The city also considers the scenic value of roads, and the city's historic districts also are considerations in its planning and permitting processes (City of Portsmouth, 2005).

The following scenic resources in the City of Portsmouth may contain views of the Shipyard:

- **Prescott Park** is a waterfront park in the City of Portsmouth, located southwest of the Shipyard. The park is part of the locally-designated Portsmouth Historic District. The park includes flower gardens, walkways, seating, docking for boats, and grass areas--all designated for public use and recreation (City of Portsmouth, 2011).
- The **Coastal Byway** is a formally designated visually sensitive resource. It is designated a Scenic and Cultural Byway by the State of New Hampshire and is located south of the Shipyard on the mainland in New Hampshire and extends from the City of Portsmouth approximately 18.5 miles south along the New Hampshire coast to Seabrook. U.S. Route 1B is an optional route that can be added to the route of this visually sensitive resource in New Hampshire. U.S. Route 1B loops east from Portsmouth to New Castle, passing close by the Shipyard, before continuing southwest to reconnect with Route 1A in the Town of Rye (Portsmouth Planning Department, 2015; National Wild and Scenic Rivers, 2011a; National Wild and Scenic Rivers, 2011b; NHDOT, 2011; Go-New Hampshire, 2011; Panoramio, 2011a).

- The **Portsmouth Historic District**, which is regulated by the Portsmouth Historic District Commission, encompasses the majority of the Portsmouth waterfront along Marcy Street, including Prescott Park, Northern Pier, and Southern Pier (Portsmouth Planning Department, 2015). The NRHP-listed Strawbery Banke Historic District is situated in the local Portsmouth Historic District and is bound by Court Street to the north, Hancock Street to the south, Marcy Street to the east, and Washington Street to the west (Garvin, 1974). A direct view of the Shipyard across the Piscataqua River is available from within the locally designated Portsmouth Historic District at Prescott Park and the two piers on the east side of Marcy Street and east of the NRHP-listed Strawberry Banke Historic District.

While the Marcy Avenue waterfront in the Portsmouth Historic District is characterized by a mixture of open space and historic development, the NRHP-listed **Strawbery Banke Historic District** is emblematic of a historic residential waterfront community. The district includes seventeenth, eighteenth, and early nineteenth-century buildings, which represent a wide variety of styles common in northern New England. This district is significant as the focal point of early commercial development and is the focus of numerous events of social, cultural, and political importance in the history of the region. In particular, the Strawbery Banke Museum and its 10-acre property preserve remnants and artifacts of the early seventeenth century history of the Portsmouth area (National Park Service, 2011a; Panoramio, 2011b; Panoramio, 2011c). In this district, several techniques for historic preservation were practiced in the twentieth century, including the relocation of several historic buildings (Garvin, 1974).

Views from locations such as these are considered sensitive because they have high scenic quality and are experienced by relatively large numbers of people (i.e., views from publicly accessible areas). The overall scenic quality is a measure of the impression or appeal of an area or resource created by the physical features of the natural and built landscape that comprise it or surround it. These sensitive visual resources are depicted in Figure 3.6-1.

3.7 Noise

This discussion of noise includes types or sources of airborne noise and noise- sensitive receptors in the human environment. Noise in relation to biological resources and wildlife species, specifically, existing ambient underwater noise, is discussed in the introduction to Section 3.5.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Sound is all around us. The perception and evaluation of sound involves three basic physical characteristics:

- Intensity: the acoustic energy, which is expressed in terms of sound pressure, in decibels (dB)
- Frequency: the number of cycles per second the air vibrates, in hertz
- Duration: the length of time the sound can be detected

Noise is defined as unwanted or annoying sound that interferes with or disrupts normal human activities. Although continuous and extended exposure to high noise levels (e.g., through occupational exposure) can cause hearing loss, the principal human response to noise is annoyance. The response of different individuals to similar noise events is diverse and is influenced by the type of noise, perceived importance of the noise, its appropriateness in the setting, time of day, type of activity during which the noise occurs, and sensitivity of the individual. While vessels and construction vehicles and equipment are not the only sources of noise in an urban or suburban environment, they are readily identified by their noise output and are given special attention in this EA.

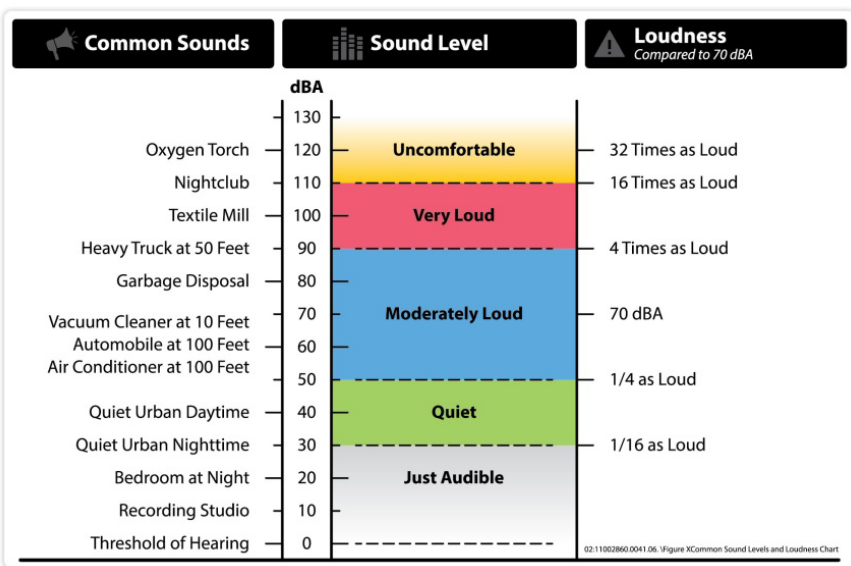
3.7.1 Basics of Sound and A-weighted Sound Level

The loudest sounds that can be detected comfortably by the human ear have intensities that are a trillion times higher than those of sounds that can barely be detected. This vast range means that using a linear scale to represent sound intensity is not feasible. The dB is a logarithmic unit used to represent the intensity of a sound, also referred to as the sound level. All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second, or hertz. To mimic the human ear's non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements are usually on an "A-weighted" scale that filters out very low and very high frequencies in order to replicate human sensitivity. It is common to add the "A" to the measurement unit in order to identify that the measurement has been made with this filtering process (dBA). In this document, the dB unit refers to A-weighted sound levels. Table 3.7-1 provides a comparison of how the human ear perceives changes in loudness on the logarithmic scale.

Table 3.7-1 Subjective Responses to Changes in A-Weighted Decibels

Change	*Change in Perceived Loudness*
3 dB	Barely perceptible
5 dB	Quite noticeable
10 dB	Dramatic; twice or half as loud
20 dB	Striking; a four-fold change

Figure 3.7-1 provides a chart of A-weighted sound levels from typical noise sources. Some noise sources (e.g., air conditioner, vacuum cleaner) are continuous sounds that maintain a constant sound level for some period of time. Other sources (e.g., automobile, heavy truck) are the maximum sound produced during an event like a vehicle pass-by. Other sounds (e.g., urban daytime, urban nighttime) are averages taken over extended periods of time. A variety of noise metrics have been developed to describe noise over different time periods, as discussed below.



Sources: Derived from Harris (1979) and Federal Interagency Committee on Aviation Noise (1997).

Figure 3.7-1 A-Weighted Sound Levels from Typical Sources

Noise Metrics

A metric is a system for measuring or quantifying a particular characteristic of a subject. Since noise is a complex physical phenomenon, different noise metrics help to quantify the noise environment. The noise metrics used in this EA are described in summary format below. While the day-night average sound level (DNL) noise metric is the most commonly used tool for analyzing noise generated at Navy installations, the DOD has been developing additional metrics (and analysis techniques). These supplemental noise metrics and analysis tools provide more detailed noise exposure information for the decision process and improve the discussion regarding noise exposure. This EA evaluates supplemental noise metrics relevant to a discussion of noise produced during temporary, intermittent construction operations, as described below.

Day-night Average Sound Level

The DNL metric is the energy-averaged sound level measured over a 24-hour period, with a 10-dB penalty assigned to noise events occurring between 10:00 p.m. and 7:00 a.m. (acoustic night). DNL values are average quantities, mathematically representing the continuous sound level that would be present if all of the variations in sound level that occur over a 24-hour period were averaged to have the same total sound energy. The DNL metric quantifies the total sound energy received and is therefore a cumulative measure, but it does not provide specific information on the number of noise events or the individual sound levels that occur during the 24-hour day. DNL is the standard noise metric used by the U.S. Department of Housing and Urban Development, the Federal Aviation Administration, USEPA, and the DoD. Studies of community annoyance in response to numerous types of environmental noise show that DNL correlates well with impact assessments: there is a consistent relationship between DNL and the level of annoyance. Most people are exposed to sound levels of 50 to 55 DNL or higher on a daily basis. Research has indicated that about 87 percent of the population is not highly annoyed by outdoor sound levels below 65 dB DNL (Federal Interagency Committee on Urban Noise, 1980).

Equivalent Sound Level

A cumulative noise metric useful in describing noise is the equivalent sound level (L_{eq}). L_{eq} is the continuous sound level that would be present if all of the variations in sound level occurring over a specified time period were smoothed out so as to contain the same total sound energy. The same calculation for a daily average time period such as DNL but without the penalties is a 24-hour equivalent sound level, abbreviated $L_{eq(24)}$. Other typical time periods for L_{eq} are 1 hour and 8 hours.

Sound Exposure Level

The sound exposure level (SEL) metric is a composite metric that represents both the intensity of a sound and its duration. Individual time-varying noise events (e.g., a vessel or vehicle passing) have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. SEL provides a measure of total sound energy of the entire acoustic event, but it does not directly represent the sound level heard at any given time. SEL captures the total sound energy from the beginning of the acoustic event to the point when the receiver no longer hears the sound. It then condenses that energy into a 1-second period of time, and the metric represents the total sound exposure received. The SEL has proven to be a good metric to compare the relative exposure of transient sounds, such as a vehicle or vessel passing, and is the recommended metric for sleep disturbance analysis (DOD Noise Working Group, 2009).

Noise Effects

An extensive amount of research has been conducted regarding noise effects including annoyance, speech interference, sleep disturbance, noise-induced hearing impairment, non-auditory health effects, performance effects, noise effects on children, and effects on domestic animals and wildlife, property values, structures, terrain, and archaeological sites. Annoyance, the primary effect of high noise levels on sensitive receptors, is discussed below. The other noise effects noted above tend to result from long-term high noise levels and are not discussed further in this EA.

Annoyance

As previously noted, the primary effect of recurring high-noise events on exposed communities is long-term annoyance, defined by the USEPA as any negative subjective reaction on the part of an individual or group. The scientific community has adopted the use of long-term annoyance as a primary indicator of community response, and there is a consistent relationship between DNL and the level of community annoyance (Federal Interagency Committee on Noise, 1992).

Potential Hearing Loss

DoD policy directive requires that hearing loss risk be estimated for the at-risk population, defined as the population exposed to DNL greater than or equal to 80 dB (DOD Noise Working Group, 2009). Noise levels generated by Shipyard industrial activities do not reach 80 dB DNL or more outside the installation boundary. There is no risk of potential hearing loss due to Navy operations for individuals working or residing outside the Shipyard. Therefore, this EA does not evaluate potential hearing loss.

Sleep Disturbance

The disturbance of sleep is generally a concern for communities exposed to nighttime industrial noise. This EA evaluates noise produced during temporary, intermittent construction activities, which will not be occurring at night; therefore, this EA does not analyze sleep disturbance effects.

Workplace Noise

In 1972, the National Institute for Occupational Safety and Health (NIOSH) published a criteria document with a recommended noise exposure limit of 85 dBA as an 8-hour time-weighted average. This exposure limit was reevaluated in 1998 when NIOSH made recommendations that went beyond conserving hearing by focusing on the prevention of occupational hearing loss. Following the reevaluation using a new risk-assessment technique, NIOSH published another criteria document in 1998, which reaffirmed the 85 dB recommended exposure limit (NIOSH, 1998). Construction contractors will be required to comply with NIOSH noise exposure limits. Temporary, intermittent construction noise is not expected to increase the risk of hearing loss for workers outside of the Shipyard; therefore, NIOSH standards are not addressed further in this EA.

3.7.2 Affected Environment

Many components of the Proposed Action may generate noise and warrant analysis as contributors to the total noise impact. The Shipyard is a dynamic industrial facility situated on an island with a narrow separation of waterways between the installation and residential and commercial areas in Kittery and Portsmouth. The predominant noise sources from Shipyard industrial operations consist of the use of dry dock cranes, passing vessels, and industrial equipment (e.g., forklifts, loaders, rigs, vacuums, fans, dust collectors, blower belts, HVAC units, water pumps, and exhaust tubes and lids). Other components

such as construction, vessel ground support equipment for maintenance purposes, vessel traffic across the Piscataqua river, and vehicle traffic on the Shipyard's bridges and on local roads in Kittery and Portsmouth produce noise, but such noise generally represents a transitory contribution to the average noise level environment (Blue Ridge Research and Consulting, Inc. [BRRC], 2015; ESS Group, 2015).

The federal government supports conditions free from noise that threaten human health and welfare and the environment. Response to noise varies, depending on the type and characteristics of the noise, the distance between the noise source and whoever hears it (the receptor), receptor sensitivity, and time of day. A noise-sensitive receptor is defined as a land use where people involved in indoor or outdoor activities may be subject to stress or considerable interference from noise. Such locations or facilities often include residential dwellings, hospitals, nursing homes, educational facilities, and libraries. Sensitive receptors may also include noise-sensitive cultural practices, some domestic animals, or certain wildlife species. The nearest sensitive receptors to the Project sites are residences located in the Town of Kittery and City of Portsmouth, and on Badgers Island. The distances to these sensitive receptors are identified in Table 3.7-2. Potentially noise-sensitive wildlife species are discussed in Section 3.5.

Table 3.7-2 Portsmouth Naval Shipyard Nearest Noise-sensitive Receptors

Project Component	*Nearest Sensitive Receptor and Relative Location*	*Approximate Distance*
Dry Dock 3	Residence north of Dry Dock 3 on Knight Avenue, Kittery	690 feet
	School northeast of Dry Dock 3, on Williams Ave, Kittery (R.W. Traip Academy)	1,600 feet
Berths 11A, 11B, and 11C	Residence building southwest of Berths 11A, 11B, and 11C adjacent to Prescott Park, Portsmouth (near Marcy Street)	1,730 feet from Berth 11C
Berth 12	Residence northwest of Berth 12, on Island Avenue, Badgers Island	740 feet
Berth 13A	Residence northwest of Berth 13A, on Old Armory Way, Kittery	950 feet
Berth 13B	Residence west of Berth 13B, on Island Avenue, Badgers Island	700 feet
Gate 1 (vehicle access)	Residence northwest of Gate 1, adjacent to Gate 1 parking lot.	200 feet
	Residence northwest of Gate 1, on intersection of Wentworth St and Walker St, Kittery	280 feet
	Rice Public Library (8 Wentworth St, Kittery). North of Gate 1.	430 feet
Gate 2 (vehicle access)	Residence adjacent to Gate 2 access (east side on Whipple Rd and Wyman Avenue, Kittery).	120 feet
	Residence adjacent to Gate 2 access (east side on Whipple Rd and Wyman Avenue, Kittery).	160 feet
	Residence in front of Gate 2 access on Whipple Rd and Wyman Avenue, Kittery.	180 feet

Source: Google Earth 2015

3.7.2.1 On-shore Noise

Existing noise levels in the vicinity of the Shipyard are typical of those normally associated with urban environments. Noise from Shipyard industrial activities is audible off the Shipyard in waterfront areas of Kittery and Portsmouth. In addition, other noise sources in the surrounding communities include vehicle traffic to and from the Shipyard.

Ambient sound levels recorded at the Shipyard are considered typical of a large outdoor industrial facility and vary widely in space and time (ESS Group, 2015). Table 3.7-3 summarizes the sound exposure and the average ambient sound levels recorded at Berths 11, 12, and 13 in 2014 during normal

operations (morning and afternoon hours), as well as the predominant operational and nature sound sources identified.

Table 3.7-3 Ambient Sound Levels Recorded at Berths 11, 12, and 13

Measurement Location	*Sound Exposure Level (SEL dBA)*		*Equivalent Sound Level (Leq dBA)*		*Predominant sources*
	Morning	*Afternoon*	*Morning*	*Afternoon*	
Berth 11	100.4	94.0	69.6	63.2	Operational sources: trucks and forklifts passing, drilling rig, circular saw noise, passing boats, front-end loaders passing Natural sources: wind noise and seagulls
Berth 12	101.1	86.5	70.3	55.7	Operational sources: crane noise and beeping, traffic on bridges and across the river, generators and personnel on barges, air compressors, idling trucks, foghorn, and passing boats Natural sources: wind noise
Berth 13	92.3	93.8	61.4	62.9	Operational sources: frequent passing and idling trucks, traffic along Route 1, intermittent public and radio announcements, front-end loader use, drilling near Berth 11, and passing boats Natural sources: Seagulls

Source: ESS Group 2015, BRRC 2015.

Key:
dBA = A-weighted decibel.
Leq = Equivalent Sound Level. It is the continuous sound level that would be present if all of the variations in sound occurring over a specified time period had the same total sound energy. It correlates reasonably well with the effects of noise on people, even for wide variations in environmental sound levels and time patterns.
SEL = Sound Exposure Level. It provides a measure of total sound energy of an acoustic event. It is commonly used for describing sound from passing vehicles.

3.8 Infrastructure

This section discusses infrastructure, including utilities (such as water distribution, wastewater collection, stormwater collection, solid waste management, energy, and communications) and facilities. Transportation systems and traffic are addressed separately in Section 3.9.

3.8.1 Regulatory Setting

The regulatory settings related to stormwater and energy are discussed below.

The CWA (33 U.S.C. 1251) establishes the basic structure for regulating discharges of pollutants into Waters of the United States. Pursuant to Section 402 of the CWA, the USEPA or its designated state authority regulates point-source discharges of pollutants, including discharges of stormwater, through the National Pollutant Discharge Elimination System (NPDES).

The Maine Department of Environmental Protection (MEDEP) is the Maine state permitting authority for the NPDES. In accordance with Phase II stormwater regulations under the NPDES, the MEDEP has issued a General Permit for the Discharge of Stormwater from State or Federally Owned Municipal Separate Storm Sewer Systems. The Shipyard's separate storm sewer system is covered under the General Permit; the Shipyard's current coverage is effective from July 1, 2013, to June 30, 2018. To comply with the requirements of the General Permit, the Shipyard has prepared and implemented a 5-year Stormwater Program Management Plan that addresses detection and elimination of illicit discharges, stormwater runoff control from construction sites, post-construction stormwater management, and pollution prevention. The Shipyard's stormwater program is designed to reduce pollutants that are discharged to the receiving waters of the Piscataqua River through best management practices, structural controls, training, inspections, and stormwater sampling (Environmental Division, Portsmouth Naval Shipyard, 2013).

Point-source discharges from the Shipyard's dry docks are authorized under a separate Maine Pollutant Discharge Elimination System permit and Maine Waste Discharge License issued by MEDEP (Permit No. ME0000868). Under this 5-year permit issued in 2011, the Navy can discharge wastewater generated by normal dry dock operations from three outfalls and dry dock dewatering water from three dry docks (Hinkel, 2011).

Maine's General Permit for Construction Activities regulates direct discharges of stormwater from construction projects disturbing a total land area of 1 acre or more (MEDEP, Bureau of Land and Water Quality, 2006). As a condition of the general permit, developers must prepare and implement an erosion and sediment control plan to protect water quality in receiving waters of the state.

New construction and major renovation projects on the Shipyard are required to meet specific standards for stormwater management under Maine's Site Location of Development Law (38 M.R.S.A. sections 481–490), the technical guidance on implementing Section 438 of the Energy Independence and Security Act (EISA), and the Navy's low-impact development (LID) policy. The stormwater management standards put into place by these laws and policies are described briefly below.

- Under the Shipyard's planning permit, issued pursuant to Maine's site law, new construction on the Shipyard is required to meet both basic and general standards for stormwater management. Basic standards apply during construction and address erosion and sedimentation control, inspection and maintenance, and pollution prevention. General standards address the design of a new facility's stormwater management system and include standards for controlling and treating runoff and standards for inspection and maintenance (MEDEP, n.d.).
- Section 438 of the EISA stipulates that federal development exceeding 5,000 square feet must maintain or restore pre-development hydrology with respect to temperature, rate, volume, and duration of flow, to the maximum extent technically feasible. Technical guidance for implementing Section 438, released by the USEPA in December 2009, provides two options for meeting the objective of preserving or restoring the hydrology of a site: a performance-based approach or a site-specific approach (USEPA, 2009).
- The Navy's LID policy focuses on implementing LID measures in lieu of conventional stormwater collection and conveyance systems in order to replicate natural systems and minimize adverse water quality impacts on receiving waters. Stormwater management requirements under the Navy's LID policy are defined in Unified Facilities Criteria 3-210-10, *Low Impact Development* (which also addresses the requirements under Section 438 of the EISA). The Navy's LID policy

sets a goal of no net increase in stormwater volume and sediment or nutrient loading from major renovation and construction projects. The policy also requires that LID be considered in the design of all projects that have a stormwater management component (Navy, 2007).

EO 13693, Planning for Federal Sustainability in the Next Decade, requires federal departments and agencies to enact specific actions and operations outlined within the EO to reduce agency direct GHG emissions by at least 40 percent over the next decade. Improved environmental performance and federal sustainability will be achieved by reducing energy use and cost. Pursuing clean sources of energy will improve energy and water security.

Chief of Naval Operations Instruction 4100.5E outlines the Secretary of the Navy's vision for shore energy management. The focus of this instruction is establishing the energy goals and implementing strategy to achieve energy efficiency.

3.8.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories of infrastructure at the Shipyard.

3.8.2.1 Utilities

Utilities refer to the systems that support the functions of a community or region. Utility systems are human-made structures that allow regions to develop and grow. The capacity of utility systems is a primary factor in the ability of a region to support physical and economic growth (Navy, 2014). The utilities that are discussed in relation to the Proposed Action include stormwater, solid waste management, and energy.

Stormwater

Stormwater runoff at the Shipyard is controlled by an extensive stormwater collection system that directs runoff through outfalls to the lower Piscataqua River. The lower Piscataqua River downstream of the Great Bay estuary is heavily industrialized and receives stormwater runoff from multiple industrial outfalls, including those of the Shipyard. The river also receives point- and non-point-source pollution from a variety of other sources (U.S. Department of Health and Human Services, 2007).

Stormwater runoff in the Project area is collected in a network of storm drains and discharged via drainage outfalls to the Piscataqua River. In addition, the concrete deck at Berths 11, 12, and 13 contains drainage openings that discharge stormwater directly to the river (MN-FST, 2015b). The Project area within the Shipyard's CIA is entirely developed with impervious surfaces.

Solid Waste Management

Solid wastes, including municipal solid waste and non-contaminated construction and demolition debris, generated at the Shipyard are recycled to the extent practicable in accordance with installation and Navy contracting procedures. The Shipyard's recycling procedures support the DoD-mandated goals to divert 50 percent of non-hazardous waste and 60 percent of construction and demolition debris from the waste stream, as part of the DOD Strategic Sustainability Performance Plan (Navy, 2012a). The Shipyard uses a private contractor for solid-waste management and disposal. Solid waste generated at the Shipyard is disposed of off-site at various licensed recycling and disposal facilities in Maine and New Hampshire (Navy, 2011).

Periodic maintenance dredging of the Shipyard's berths and dry dock entrances results in dredged sediments, or spoils. The Navy authorizes dredging contractors to reuse dredged spoils for construction purposes or dispose of them. Dredge spoils exceeding Maine Department of Environmental Protection Solid Waste Management Rules (Chapter 418) criteria for toxicity are transported to authorized landfills for disposal in accordance with the requirements of the solid waste management rules and regulations (38 M.R.S.A. Section 1301) (MN-FST, 2015b).

Energy

The Shipyard is located in the Northeast Power Coordinating Council New England eGRID subregion (Northeast Power Coordinating Council, Inc., n.d.; USEPA, 2010). The U.S. Energy Information Administration reports that electricity generated totaled 14,030,038 megawatt-hours (MWH), and 11,855,047 MWH of electricity was sold in Maine in 2013. The state's primary source of energy is natural gas (U.S. Energy Information Administration, 2015).

The Shipyard produces a large quantity of electricity for its own use through a combined heat and power plant consisting of two 5-megawatt (MW) co-generation turbines. When there is a need for additional power, the Shipyard purchases electricity from the Defense Energy Support Center. Central Maine Power, a subsidiary of Iberdrola USA, provides the transmission infrastructure that carries electricity purchased from the Defense Energy Support Center (Navy, 2012a). Central Maine Power serves more than 600,000 customers in central and southern Maine (Central Maine Power, n.d.). Overhead lines owned by Central Maine Power carry electricity to the Franklin Substation on the Shipyard, where it is distributed to Shipyard facilities through Navy-owned buried and overhead distribution lines (Navy, 2014).

Electricity is used on the Shipyard to provide direct power, heat buildings, produce steam, and provide high-pressure air service. The amount of energy consumed by the Shipyard fluctuates based on the number of submarines berthed or in dry dock and the type and tempo of submarine overhaul and repair operations underway at any given time. In 2014, the Shipyard used approximately 84,900 MWH of electricity, an average of approximately 7,000 MWH per month (Simpson, 2015). Of the annual amount of electricity used, an average of approximately 5,000 MWH (70 percent) was generated on base and 2,000 MWH (30 percent) was purchased (Simpson, 2015). The Shipyard's electrical distribution system consists of electrical substations and mechanical distribution systems, including buried and overhead distribution and feeder lines. Electrical distribution and feeder lines in the CIA typically are buried to protect them from damage and to maximize the use of space in operational areas.

3.9 Transportation

This discussion of transportation includes all of the land and sea routes with the means of moving passengers and goods in the vicinity of the Project area. A transportation system can consist of any or all of the following: roadways, bus routes, railways, subways, bikeways, trails, airports, and taxis. These systems can be analyzed on a local or regional scale.

3.9.1 Regulatory Setting

State and local weight and size restrictions for vehicles traveling on roads and bridges are applicable to construction vehicles used to transport materials and equipment to and from the Project sites. Permits must be obtained for any overweight or oversize loads, and such permits may stipulate safety measures such as the use of flaggers, pilot vehicles, and warning signs. Such measures are not anticipated to be

necessary for the transport of most equipment and materials, such as fill material, to and from the Project sites via trucks. The use of barges for delivery of materials and large equipment, such as cranes used for in-water construction activities, is subject to standard rules and regulations for navigation within the federal navigation channel and to the Project sites.

3.9.2 Affected Environment

The Shipyard is located near three major roadways that run north-south between Maine and New Hampshire: Interstate 95 (I-95), U.S. Route 1, and the U.S. Route 1 Bypass. Access to the Shipyard is provided by State Route (S.R.) 103 (Government Street/Wentworth Street/Whipple Road) and Walker Street (see Figure 3.9-1). The most recent documented average annual daily traffic counts for these roads are provided in Table 3.9-1. As shown in Table 3.9-1, I-95 carries the highest volume of traffic between Maine and New Hampshire.

Table 3.9-1 Average Annual Daily Traffic in the Vicinity of Portsmouth Naval Shipyard

Road	*Section*	*AADT (Year)*
Interstate 95	Northbound at the New Hampshire state line	36,320 (2014)
	Southbound at the New Hampshire state line	37,500 (2014)
U.S. Route 1	At the New Hampshire state line (Memorial Bridge) (Northbound and Southbound)	8,650 (2010)
	Northbound north of State Route (S.R.) 103 (Walker Street)	4,110 (2013)
	Southbound south of S.R. 103 (Walker Street)	4,420 (2010)
U.S. Route 1 Bypass	At the New Hampshire state line (Sarah Mildred Long Bridge) (Northbound and Southbound)	15,670 (2011)
	Northbound southwest of U.S. Route 1	4,110 (2010)
	Southbound southwest of U.S. Route 1	2,640 (2010)
S.R. 236 (Shapleigh Road)	Southeast of Rogers Road (Northbound and Southbound)	12,070 (2013)
S.R. 103 (Walker Street)	East of U.S. Route 1 (Eastbound and Westbound)	8,460 (2013)

Source: Maine Department of Transportation, 2015a

Where both directions are indicated, AADT indicates total number of vehicles traveling in both directions.

Key:
AADT = average annual daily traffic

The Sarah Mildred Long Bridge on the U.S. Route 1 Bypass will be replaced with a new bridge being constructed next to the existing bridge. Construction began in January 2015, and the project is scheduled to be completed in June 2018. The existing bridge is scheduled to be closed from November 2016 through August 2017, with the new bridge opening to traffic in September 2017 (Maine Department of Transportation 2015b). Further discussion of this project is provided in Chapter 5.

Railroad access for material and equipment shipments is provided to the Shipyard via a dedicated rail line that runs to the Shipyard from a junction with the Montreal, Maine, and Atlantic Railway, Ltd., line in Portsmouth, New Hampshire, near the Sarah Mildred Long Bridge. The Proposed Action would have no effect on railroad transportation or rail traffic; therefore, the railroad is not further discussed in this EA.

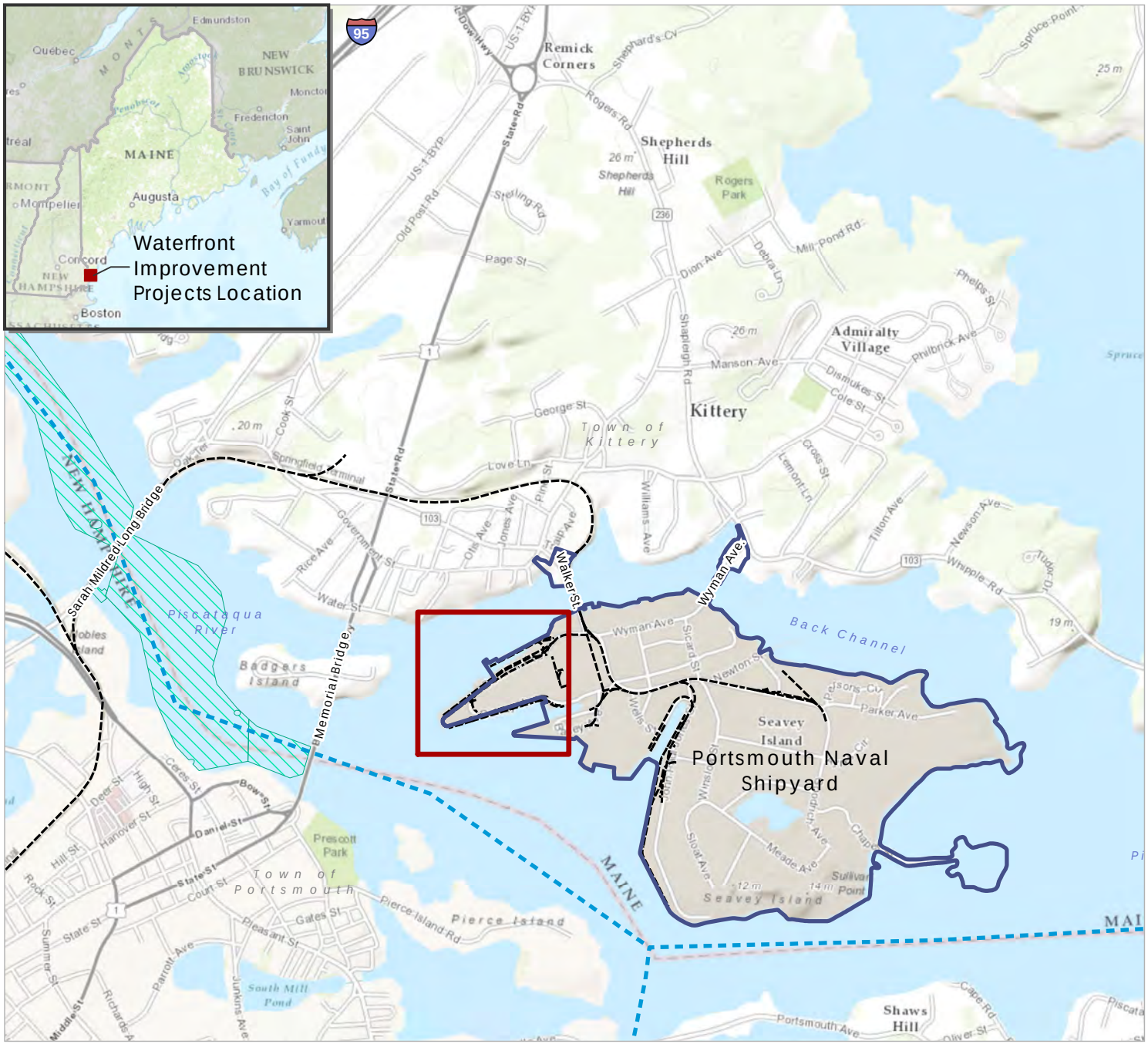


Figure 3.9-1
Transportation
Portsmouth Naval Shipyard
York County, Maine

Legend

- Project Area
- Installation Area
- Navigation Channel
- Navigation Lanes
- Railroad

N

0 500 1,000 1,500 2,000 Feet

Source: ESRI 2013; Department of Defense 2014; Maine Department of Transportation 2011.

Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\EA\Figure_3_9_1_Transportation_Near_ProjectArea.mxd

The deep-water shipping channel of the Piscataqua River allows larger vessels to access the Shipyard and marine terminals and fishing piers along the river. The shipping channel, also known as the Port of New Hampshire, is used by military vessels, cargo ships, commercial fishing ships, and recreational vessels. In 2012, the port handled more than 2 million metric tons of cargo (U.S. Army Corps of Engineers, 2013). Approximately 55 fishing vessels operate from the Commercial Fish Pier on Peirce Island (Pease Development Authority, n.d.). There are approximately 20 boating facilities for local or transient boats in the area of the port (U.S. Army Corp of Engineers, n.d.).

3.10 Hazardous Materials and Wastes

This section discusses hazardous materials, hazardous waste, toxic substances, and contaminated sites.

3.10.1 Regulatory Setting

Hazardous materials are defined by 49 CFR section 171.8 as "hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table, and materials that meet the defining criteria for hazard classes and divisions" in 49 CFR part 173. Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations.

Hazardous wastes are defined by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments, as: "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed." Certain types of hazardous wastes are subject to special management provisions intended to ease the management burden and facilitate the recycling of such materials. These are called universal wastes and their associated regulatory requirements are specified in 40 CFR part 273. Four types of waste are currently covered under the universal wastes regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, hazardous waste thermostats, and hazardous waste lamps. The Maine Department of Environmental Protection (MEDEP) regulates hazardous waste under Chapters 850 to 857 of the Hazardous Waste Management Rules.

Special hazards are those substances that might pose a risk to human health and are addressed separately from other hazardous substances. Special hazards include asbestos-containing material (ACM), PCBs, and lead-based paint (LBP). The USEPA is given authority to regulate special hazard substances by the Toxic Substances Control Act. Asbestos is also regulated by the USEPA under the Clean Air Act and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). MEDEP regulates asbestos under Maine Solid Waste Management Rules (Chapter 425), Asbestos Management Regulations, and regulates PCBs largely under the Maine Hazardous Waste Management Rules. Maine LBP regulations apply to residential dwellings and child-occupied facilities and are not applicable to the Shipyard.

3.10.2 Affected Environment

The Navy has implemented a strict hazardous material control and management program and a hazardous waste minimization program for all activities. These programs are governed Navy-wide by

applicable OPNAVINST and at the installation by specific instructions issued by the base commander as discussed in the following sections. The Navy continuously monitors its operations to find ways to minimize the use of hazardous materials and to reduce the generation of hazardous wastes.

3.10.2.1 Hazardous Materials

To support its mission and daily activities, the Shipyard uses a wide variety of hazardous materials, including paints, cleaners, solvents, chemicals, acids, oils, and fuel. Such materials have been used in the Project area associated with the Proposed Action.

A few aboveground storage tanks (ASTs) exist in and near the Project area. An AST is present at the western end of Dry Dock 3 and two ASTs are located north of the western end of Dry Dock 1, in a partial construction area for work at Berth 11A. These ASTs are used for the storage of diesel fuel or oily water. The Shipyard's Spill Prevention, Control, and Countermeasure Plan contains procedures to prevent the discharge of oil from onshore facilities such as ASTs into navigable waters of the U.S. in accordance with 40 CFR part 112, Oil Pollution Prevention(Navy, 2013c).

A hazardous material survey performed for constituents in soil in areas adjacent to Berths 11, 12, and 13, in support of the Proposed Action, reported some elevated levels of chemical constituents, which are further discussed in Section 3.10.2.2.

3.10.2.2 Hazardous Waste

Shipbuilding and submarine repair activities at the Shipyard have resulted in the generation and disposal of hazardous wastes. These wastes are primarily from mechanical, structural, electrical/electronic, and public works activities and include waste fuel/oil, solvents, chemicals, pesticides, plating wastes, and paint (Navy, 2013d). With the exception of plating wastes, similar hazardous wastes are occasionally generated in the Project areas from daily operational activities.

Hazardous wastes are containerized, stored, managed, and disposed of in accordance with Shipyard Instruction 5090.30A, Hazardous Waste Generator Standards (Navy, 2012b), which complies with RCRA and MEDEP hazardous waste requirements.

The hazardous material survey performed for constituents in soil in areas adjacent to Berths 11, 12, and 13, in support of the Proposed Action, reported total petroleum hydrocarbons and arsenic in one or more soil samples at concentrations exceeding Maine remedial action guideline standards. Sediment in certain areas near Berth 11 contains lead and arsenic at levels above MEDEP Solid Waste Management Rules for Beneficial Use of Solid Wastes (Chapter 418). Sediment in the locations sampled near Berth 13 does not contain such constituents, and sediment near Berth 12 was not sampled during that study (MN-FST, 2015b).

A hazardous building materials survey conducted at Dry Dock 3 in 2015 in support of the Proposed Action reported the presence of mercury-containing light bulbs in some fluorescent light fixtures at the dry dock, typically in the control room (Appledore Marine Engineering, 2015). If removed and handled, such equipment would become hazardous waste.

3.10.2.3 Special Hazards (Asbestos-containing Material, Lead-based Paint, Polychlorinated Biphenyls)

A hazardous material survey performed for ACM and LBP at Berths 11, 12, and 13, in support of the Proposed Action, did not find ACM but reported the presence of LBP on the berths. Sediment in certain areas near Berth 13 contains PCBs at levels above MEDEP Solid Waste Management Rules for Beneficial

Use of Solid Wastes (Chapter 418). Sediment in the locations sampled near Berth 11 does not contain PCBs, and sediment near Berth 12 was not sampled during that study(MN-FST, 2015b).

A hazardous building materials survey conducted at Dry Dock 3 in 2015 in support of the Proposed Action did not indicate the presence of asbestos or PCBs in suspect materials but did report the presence of gray LBP on certain exterior portions of the caisson (Appledore Marine Engineering, 2015).

Information on special hazards in other Project areas was not available. Based on the age of the Shipyard, it can be assumed that ACM and LBP could be present in older structural components in the Project area. The USEPA banned the use of most asbestos-containing products by 1989, and the manufacture of many LBPs was curtailed beginning in 1978. Structures and components in the Project areas that pre-date those dates could contain some of those materials, most notably LBP on berths, dry docks, and piers. Any low-level PCBs at the Shipyard would be associated with transformer oil, certain equipment fluids, and certain fluorescent light ballasts, which would not tend to be encountered under the Proposed Action.

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4 Environmental Consequences

This chapter presents an analysis of the potential direct and indirect effects of each alternative on the affected environment. The following discussion elaborates on the nature of the characteristics of each alternative that might relate to specific resources. "Significantly," as used in the National Environmental Policy Act (NEPA), requires considerations of both context and intensity. Context means that the significance of an action must be analyzed in several contexts, such as society as a whole (e.g., human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of a Proposed Action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant (40 Code of Federal Regulations [CFR] part 1508.27). Intensity refers to the severity or extent of the potential environmental impact, which can be thought of in terms of the potential amount of the likely change. In general, the more sensitive the context, the less intense a potential impact needs to be in order to be considered significant. Likewise, the less sensitive the context, the more intense a potential impact would need to be to be considered significant.

4.1 Air Quality

Effects on air quality are based on the estimated direct and indirect emissions associated with construction of each of the waterfront improvement projects under each alternative and the impact of the projected changes in emissions on local and regional air quality, regional greenhouse gas (GHG) levels, and climate change. Estimated emissions from a proposed federal action are typically compared with the relevant national and state standards to assess the potential for increases in pollutant concentrations.

The region of influence (ROI) for assessing air quality impacts is York County, within the Metropolitan Portland Intrastate Air Quality Control Region (MPIAQCR). The General Conformity Rule does not apply to this action because the region is in attainment for all National Ambient Air Quality Standards (NAAQS). The MPIAQCR had previously been designated a nonattainment area for the 1997 ozone standard and has been subject to a maintenance plan under that standard; however, on March 6, 2015, the U.S. Environmental Protection Agency (USEPA) revoked the 1997 8-hour ozone NAAQS (80 FR 12264; *Federal Register*, 2015).

Air Quality Potential Impacts:

- No Action: No change in emissions. No change in the vulnerability of Shipyard waterfront infrastructure to the impacts of climate change.
- Alternative 1: Annual direct emissions of criteria pollutants during construction and after implementation would not result in significant impacts to air quality. Minimal annual increase in GHG emissions that would not be likely to contribute to global warming to a discernible extent. Reduced vulnerability of Shipyard waterfront infrastructure to the impacts of climate change.
- Impacts under Alternative 2 would be similar to those under Alternative 1.

4.1.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and there would be no change to baseline air quality. Therefore, no significant impacts on air quality would occur with implementation of the No Action Alternative.

Greenhouse Gases and Climate Change

The No Action Alternative would not result in increased GHG emissions. As a result of climate change, regional sea level rise and coastal flooding are projected to increase in the future, causing increased risk of damage to coastal infrastructure (USEPA, 2015d). The No Action Alternative would not provide protection against these risks, leaving waterfront infrastructure in the Project area at greater risk from climate change impacts.

4.1.2 Alternative 1 (Preferred Alternative)

The study area encompasses the proposed construction and ground disturbance areas and vehicle operations related to Alternative 1. Alternative 1 incorporates in-water construction techniques for the proposed bulkheads at Berths 11A and 11B (Phase 1) and Berths 12 and 13 (Phase 2) that require dredging and pile driving. Construction of the king pile and concrete shutter panel bulkheads at Berths 11, 12, and 13 would minimize the amount of pile driving required. Option 1 would include the repair of Berth 11C under Phase 1. Alternative 1 also includes replacement of the Dry Dock 3 caisson, repair of the inner caisson seat, and limited in-water repair of the caisson seat at Dry Dock 3. A full description of the construction activities can be found in Section 2.3.2.

4.1.2.1 Potential Impacts

The Proposed Action would result in direct emissions of criteria air pollutants during construction.

Construction would result in temporary and minor increases in air emissions from the combustion of fossil fuels in equipment and vehicles during demolition, dredging, pile and fill delivery and placement, and construction, as well as emissions of fugitive dust and dirt. It is conservatively assumed that all construction under Phase 1 of the berth structural repairs at Berth 11 and at the Dry Dock 3 caisson would occur within one year. It is also assumed that all construction under Phase 2 of the berths structural repairs project at Berths 12 and 13 would occur within a single year. Since the construction periods for the projects may take two or three years, these assumptions are conservative. Table 4.1-1 shows estimated criteria pollutant emissions from construction activities of Phase 1 and 2 for Alternative 1. Appendix C includes the assumptions and calculations used to develop these estimates. These total emissions would be minor, temporary, and dispersed over time and location; therefore, implementation of Alternative 1 would not result in significant impacts on air quality.

Since vehicle emissions associated with the Proposed Action would be minimal and no sensitive receptors are nearby, it is assumed that hazardous air pollutant (HAP) emissions would be minimal and would cause no impacts on air quality.

The proposed action under either Alternative 1 or 2 would not result in any increases in operating emissions, construction of any new major stationary emission sources or major modifications of any existing major stationary emission sources at the Shipyard. Therefore, a prevention of significant deterioration (PSD) permit and Title V Operating Permit are not required for the proposed action.

Greenhouse Gases and Climate Change

Implementation of Alternative 1 would contribute directly to emissions of GHGs from the combustion of fossil fuels. Carbon dioxide emissions from demolition and construction are shown in Table 4.1-1. This temporary increase in GHG emissions from construction is below the Council on Environmental Quality (CEQ) threshold of 25,000 metric tons, and quantification of these estimates is not required. This limited amount of emissions would not likely contribute to global warming to any discernible extent.

Table 4.1-1 Estimated Construction Emissions, Alternative 1 (Preferred Alternative)

Activity	*Emission Totals (tons)*							*Metric Tons*
	VOCs	*NOx*	*CO*	*PM2.5*	*PM10*	*SO2*	*CO2*	*MTCO2*
Phase 1								
Berths 11A and B	2.81	34.77	17.33	2.06	2.12	0.85	3,868	3,508
Option 1: Berth 11C	1.41	17.38	8.66	1.03	1.06	0.42	1,934	1,754
Dry Dock 3 Caisson	0.50	5.00	4.14	0.30	0.31	0.11	541	491
On-road Vehicle Operations, Phase 1	0.28	0.64	2.54	0.11	0.92	0.01	182	165
On-road Vehicle Operations, Phase 1, Option 1	0.19	0.35	1.78	0.07	0.60	0.006	109	99
Phase 1 Total	3.60	40.41	24.01	2.47	3.35	0.97	4,591	4,164
Phase 1 with Option 1 Total	5.00	57.80	32.68	3.50	4.41	1.39	6,525	5,918
Phase 2								
Berths 12 and 13	2.81	34.77	17.33	2.06	2.12	0.85	3,868	3,508
On-road Vehicle Operations	0.20	0.62	1.82	0.09	0.72	0.01	157	143
Phase 2 Total	3.02	35.39	19.14	2.15	2.84	0.86	4,025	3,651

Key:
CO = carbon monoxide
CO_2 = carbon dioxide
$MTCO_2$ = metric tons of carbon dioxide
NO_x = nitrogen oxide
PM_{10} = particulate matter equal to or smaller than 10 microns in diameter
$PM_{2.5}$ = particulate matter equal to or smaller than 2.5 microns in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound

Sea level rise and coastal flooding are projected to increase in the future, causing increased risk of damage to coastal infrastructure (USEPA, 2015d). The Navy's Climate Change Roadmap (Navy, 2010) outlines the Navy's approach to observing, predicting, and adapting to climate change. The document states that climate change is a national security challenge, with strategic implications for the Navy, and that climate change is affecting, and will continue to affect, U.S. military installations and access to natural resources worldwide (Navy, 2010). Alternative 1 would repair and strengthen waterfront infrastructure at the Shipyard, potentially reducing the vulnerability of the installation to the impacts of climate change. In response to the projected increased risk of sea level rise and coastal flooding, the design for the new Dry Dock 3 caisson increases the height of the caisson by 1 foot to minimize risks to dry dock operations.

Therefore, implementation of Alternative 1 would not result in significant impacts on air quality.

4.1.3 Alternative 2

Alternative 2 differs from Alternative 1 in the in-water construction method proposed at Berths 11, 12, and 13, and the extent of Dry Dock 3 caisson seat repair. The steel sheet-pile bulkheads at Berths 11A and 11B (Phase 1), and Berths 12 and 13 (Phase 2) proposed under Alternative 2 would require additional pile driving. Option 1 would include the repair of Berth 11C under Phase 1. Under Alternative 2, more extensive repairs would be completed to the outer caisson seat at Dry Dock 3. The level of

repairs proposed under this alternative would require construction of a temporary, circular cellular cofferdam around the entrance to Dry Dock 3 to create a dry work area.

4.1.3.1 Potential Impacts

Under Alternative 2, the Proposed Action would result in direct emissions of criteria air pollutants during construction. Under Alternative 2, more equipment would be used for pile driving compared with Alternative 1. Therefore, total emissions would be only slightly different between the alternatives.

As discussed in Section 1.1.2.1, construction emissions are estimated as they were for Alternative 1, and Table 4.1-2 shows estimated criteria pollutant emissions from construction activities of Phase 1 and 2 for Alternative 2. As noted under Alternative 1, under each phase, all of the construction was conservatively assumed to occur in a single year. All construction for the Dry Dock 3 caisson replacement has been included under Phase 1. Total emissions under Alternative 2 would be minor, temporary, and dispersed over time and location; therefore, implementation of Alternative 2 would not result in significant impacts on air quality.

Table 4.1-2 Estimated Construction Emissions, Alternative 2

Activity	*Emission Totals (tons)*							*Metric Tons*
	VOCs	*NOx*	*CO*	*PM2.5*	*PM10*	*SO2*	*CO2*	*MTCO2*
Phase 1								
Berths 11A and B	2.93	35.64	17.75	2.14	2.20	0.86	3,948	3,581
Option 1: Berth 11C	1.46	17.82	8.88	1.07	1.10	0.43	1,974	1,791
Dry Dock 3 Caisson	0.78	8.85	5.03	0.47	0.49	0.21	970	880
On-road Vehicle Operations, Phase 1	0.35	0.79	3.21	0.14	1.15	0.01	225	204
On-road Vehicle Operations, Phase 1, Option 1	0.20	0.37	1.86	0.07	0.63	0.01	116	106
Phase 1 Total	4.06	45.28	26.00	2.75	3.84	1.09	5,144	4,666
Phase 1 with Option C Total	5.73	63.48	36.73	3.89	5.57	1.52	7,234	6,562
Phase 2								
Berths 12 and 13	2.53	30.67	16.33	1.88	1.93	0.76	3,437	3,118
On-road Vehicle Operations	0.20	0.64	1.82	0.09	0.72	0.01	161	146
Phase 2 Total	2.74	31.31	18.15	1.97	2.65	0.77	3,598	3,263

Greenhouse Gases

Implementation of Alternative 2 would contribute directly to emissions of GHGs from the combustion of fossil fuels. Carbon dioxide emissions from demolition and construction are shown in Table 4.1-2. This limited amount of emissions would not likely contribute to global warming to any discernible extent.

Sea level rise and coastal flooding are projected to increase in the future, causing increased risk of damage to coastal infrastructure (USEPA, 2015d). The Navy's Climate Change Roadmap (Navy, 2010) outlines the Navy's approach to observing, predicting, and adapting to climate change. The document states that climate change is a national security challenge, with strategic implications for the Navy, and that climate change is affecting, and will continue to affect, U.S. military installations and access to natural resources worldwide (Navy, 2010). Like Alternative 1, Alternative 2 would repair and strengthen

waterfront infrastructure at the Shipyard and increase the height of the Dry Dock 3 caisson by 1 foot, potentially reducing the vulnerability of the installation to the impacts of climate change.

Therefore, implementation of Alternative 2 would not result in significant impacts on air quality.

4.2 Water Resources

Water Resources Potential Impacts:

- No Action Alternative: No change in existing water resources.
- Alternative 1: Short-term minor impacts on water resources during construction. Long-term, minor impacts on wetlands due to permanent fill of 98,800 square feet to 118,800 square feet (with Option 1) of the Piscataqua River. Impacts would be minimized through use of standard BMPs and compliance with applicable federal and state permits and regulations.
- Alternative 2: Greater short-term and long-term impacts during construction as a result of additional pile driving and fill under this alternative. Impacts would be minimized through use of standard BMPs and compliance with applicable permits and regulations.

4.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change in existing water resources in or near the Project area. Therefore, no significant impacts on water resources would occur with implementation of the No Action Alternative.

4.2.2 Alternative 1 (Preferred Alternative)

Alternative 1 would involve in-water construction, dredging, and fill at Berths 11, 12, and 13 and Dry Dock 3 that would directly impact water resources. Indirect impacts could result from ground-disturbing and general construction activities in upland parts of the Project area.

4.2.2.1 Potential Impacts

Surface Water

Short-term impacts on surface water quality in the Piscataqua River would result from dredging, filling, and dewatering during construction. The proposed Berths 11, 12, and 13 structural repairs project would be required to comply with the conditions of an individual USACE permit and a Maine Department of Environmental Protection (MEDEP) individual Natural Resources Protection Act (NRPA) permit that will be obtained before the start of construction. No dredging or fill would be required for the Dry Dock 3 caisson replacement and in-water caisson seat repairs proposed under Alternative 1.

<u>Berths 11, 12, and 13 Structural Repairs</u>

At the start of each phase of in-water construction for the proposed Berths 11, 12, and 13 structural repairs, a level trench would be dredged along the footprint of the bulkheads and filled with granular material to provide a seat for the concrete shutter panels. Before the start of dredging, temporary silt curtains with floating containment booms would be placed approximately 18 feet off of Berths 11 and 13 to contain debris or sediment suspended during the dredging, and would remain in place during construction. Berth 12 is a relatively short berth (150 feet in length) situated at the nose of the pier complex. The berth juts out into the Piscataqua River and is subjected to very swift tidal currents making it difficult to maintain an effective silt curtain under these conditions. Further, due to the strong currents, the river bottom in front of Berth 12 is heavily armored with riprap to provide scour protection. Therefore, the material that would be removed to facilitate the Berth 12 bulkhead installation includes some of the riprap and a minimal quantity of sediment. Because of the exposure to the current, the short overall berth length and the type/quantity of material being removed, the Navy

has determined that the efforts to install, secure, and maintain a silt curtain at Berth 12 would lengthen the construction duration and the associated time-dependent impacts while providing little effective sedimentation control.

Water inside the silt curtains at Berths 11 and 13 would be cleaned of debris and silt as needed, but it is expected that sediments suspended during dredging would quickly settle out of the water column. Dredged sediments that are found to be contaminated above the threshold levels in the MEDEP Solid Waste Management Rules (Chapter 418) for Beneficial Reuse of Solid Wastes, and therefore cannot be reused as fill material behind the proposed bulkheads, would be dewatered on a construction barge, amended with concrete, and disposed of at an approved landfill. Construction dewatering discharges will be required to comply with the Water Quality Certification issued by the MEDEP as part of the NRPA permitting process. Disposal of dredge spoils at an in-water disposal site is not being considered as part of the Proposed Action; therefore, no impacts on surface water quality would result from disposal of dredge spoils.

Removal of contaminated sediments would comply with the hazardous waste operations and emergency response requirements specified in the Navy's ER Program, which specifies measures to protect human health and the environment from hazardous substances. More information on the types of contaminants potentially occurring in areas off of Berths 11, 12, and 13 and potential impacts resulting from the Proposed Action is provided in Sections 3.10 and 4.10.

Pile driving would be minimized under Alternative 1. Rock-socketing the king piles along the bulkhead footprints and placing the concrete shutter panels would result in minimal suspension of sediments in the construction areas. The socket drill used to install the king piles would operate within a casing that would contain sediments disturbed during drilling. Sediments and drill spoils captured during drilling would be disposed of at an approved landfill facility off of the Shipyard in accordance with state rules and regulations.

Sediments in the immediate construction areas at the berths would be re-suspended during dredging, resulting in temporary impacts on the surface waters from increased turbidity and decreases in the dissolved oxygen concentration. Turbidity and decreases in the dissolved oxygen concentration during in-water construction would not be expected to contribute to the impairment of the Piscataqua River for its designated uses in Maine and New Hampshire (see Section 3.2) because of the temporary nature of the potential water quality impacts.

Turbidity plumes associated with dredging would likely be of short duration and involve minimal spreading due to the dynamic nature of the estuarine environment and the grain size of the material being removed. Sediment in the Project area primarily consists of soft mud, sand, pebbles, and old mussel shells in areas of low energy current and hard sand, pebbles/cobbles and small boulders in areas of higher current flow (see Section 3.1.2). The coarser grain sizes would be expected to settle out of the water column fairly quickly and close to the area of disturbance (USEPA, 1999). Also, because the Piscataqua River estuary is a dynamic coastal area, riverine flushing and tidal action, combined with the rapid settling of sediment, are expected to quickly return concentrations of suspended sediment to background levels (Reynolds et al., 1990). Turbidity can also decrease the dissolved oxygen concentration in the water column (USEPA, 2015f); however, the dynamic nature of the estuary results in mixing of the water column, which in turn would dilute and disperse any areas of depressed dissolved oxygen. In summary, there would be a temporary, minor, and localized adverse effect on the surface water quality during dredging as a result of turbidity. Within a short time after construction is complete

the surface waters would return to pre-construction conditions. The berths are subject to periodic maintenance dredging; therefore, the increased turbidity resulting from dredging during the Proposed Action would be similar to that resulting from maintenance dredging at the Shipyard.

Construction of the bulkheads around Berths 11 (A and B), 12, and 13 (A and B), and Berth 11C if Option 1 is implemented, would require filling approximately 98,800 square feet to 118,800 square feet (with Option 1) of the previously filled area beneath the pier and the Piscataqua River bottom within 5 feet of the existing berth faces. Approximately 1,142,000 cubic feet to 1,405,000 cubic feet (with Option 1) of fill would be required. The area that would be filled and amount of fill required would be minimized to the maximum extent practicable by constructing the bulkheads within 5 feet of the existing faces of the berths. The Navy will apply for an individual USACE permit under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for the bulkheads. The Navy also will apply for an individual NRPA permit from the MEDEP for the proposed fill. The proposed filling will comply with the conditions of these permits.

Compensatory mitigation for the loss of coastal habitat functions and values as a result of the proposed fill will occur in the form of an in-lieu fee paid to the Maine DEP prior to the start of construction in accordance with the Maine Natural Resources Protection Act (38 M.R.S.A. §480-Z), Sections 404 and 401 of the Clean Water Act (33 U.S.C. §1251 et seq.), and Section 10 of the Rivers and Harbors Act (33 U.S.C. §403 et seq.). The total fee will be determined by the total area of fill at Berths 11, 12, and 13. Fees paid under the Maine In-Lieu Fee Compensation Program are used under the Maine Natural Resources Conservation Program for restoration, enhancement, creation, and preservation of Maine's protected natural trust resources, typically in the same biophysical region in which the impacts would occur. The goal of both programs is to strategically use in-lieu fees to increase the extent and quality of protected natural trust resources, compared with the extent and quality of resource protection typically achieved by other methods of compensatory mitigation (USACE New England District n.d.; Maine DEP 2013).

During backfill of each bulkhead, geotextile fabric would be placed against the interior of the bulkhead to catch most debris or silt forced with water through seams in the bulkhead during compaction. Temporary silt curtains and booms would be used during the backfill process to catch debris or silt that escapes the bulkhead. Water inside of the silt curtain would be cleaned of debris and silt as needed. Use of the geotextile fabric and silt curtains and booms would minimize impacts on water quality outside the immediate in-water construction areas. Sediments suspended in the water column would be expected to quickly settle to the bottom for the reasons described above.

Sections of timber and concrete pier deck would be removed at Berths 11, 12, and 13 as needed to allow backfill of the bulkheads, installation of the sister piles, and repair of existing piles. Standard best management practices (BMPs) would be used in the upland portions of the construction sites to minimize impacts on water quality in the Piscataqua River resulting from erosion of exposed soils and sedimentation, release of construction debris, or spills. BMPs may include proper debris disposal practices and BMPs stipulated in the *Maine Erosion and Sediment Control Practices Field Guide for Contractors* (MEDEP, 2014). Construction would comply with the Maine Erosion and Sediment Control Law. Erosion control measures would be installed prior to construction, and a soil and erosion control plan would be implemented to guide appropriate placement of control measures on the site. The king pile and concrete shutter panel bulkhead would prevent release of fill material into the river.

Construction and demolition for the proposed berths structural repairs under Alternative 1 would comply with MEDEP Chapter 500, Stormwater Management Law. Ground-disturbing activities also would be conducted in accordance with the Maine Site Location of Development Law.

Dry Dock 3 Caisson Replacement

In-water repairs to the outer caisson seat at Dry Dock 3 under Alternative 1 would not require any new in-water construction or fill; therefore, impacts on surface waters as a result of this Project would be minimal and short term. Increased turbidity in the immediate construction area may occur during repair of the outer caisson seat. Turbidity impacts would be temporary, minimal, and localized for the reasons described above. Use of the tremie concrete method, in which concrete displaces water from the area being filled, during construction of the temporary cofferdam would prevent concrete from becoming diluted and dispersing into surrounding waters. Therefore, water quality impacts during concrete placement are not expected.

Limited upland work would be required at Dry Dock 3 to install the new caisson. Repairs to the dry dock or pier at this location would incorporate standard BMPs as described above and would comply with the Maine Erosion and Sedimentation Control Law. Erosion control measures would be installed prior to construction, and a soil and erosion control plan would be implemented to guide appropriate placement of control measures on the site.

Because the proposed in-water projects would not result in changes to operations at the Berths 11, 12, and 13 or Dry Dock 3, no long-term changes in surface water quality are expected.

The proposed waterfront improvement projects would not convert any pervious surfaces to impervious surfaces and therefore would not change the pre-development hydrology of the Project sites. Potential short-term impacts on stormwater management are discussed in Section 4.8.

Compliance with applicable state laws and implementation of the BMPs noted above would minimize temporary water quality impacts during construction. As noted above, the pre-development hydrology of the project sites would not be changed as a result of construction because the Project sites would remain paved. Based on the analysis above, the Proposed Action under Alternative 1 would result in short-term, localized, minor impacts on surface water. No significant short- or long-term impacts would result.

Wetlands

Alternative 1 would result in the permanent fill of approximately 98,800 square feet to 118,800 square feet (with Option 1) of the previously filled area beneath the pier and the Piscataqua River bottom within 5 feet of the existing berth faces. The previously unfilled area of river bottom that would be impacted would not exceed 11,185 square feet (0.26 acres) with implementation of Alternative 1. The proposed fill would impact the Piscataqua River, an estuarine and marine deepwater wetland, resulting in the permanent removal of water column, marine sediments, and benthic habitat (see Marine Sediments, below, and Section 4.5 for additional discussion). As noted, compensatory mitigation for the loss of coastal habitat functions and values as a result of the proposed fill will occur in the form of an in-lieu fee paid to the Maine DEP prior to the start of construction in accordance with the Maine Natural Resources Protection Act (38 M.R.S.A. §480-Z), Sections 404 and 401 of the Clean Water Act (33 U.S.C. §1251 et seq.), and Section 10 of the Rivers and Harbors Act (33 U.S.C. §403 et seq.).

In-water construction activities, such as dredging and pile driving, at Berths 11, 12, and 13 and the Dry Dock 3 caisson would result in short-term, localized impacts on water quality from re-suspended sediments and turbidity that could indirectly impact estuarine intertidal and marine intertidal wetlands along the eastern shoreline of Badger's Island, approximately 400 feet west-northwest of Dry Dock 3 and the northern shoreline of the Back Channel of the Piscataqua River, approximately 600 feet north of the northern side of Dry Dock 3. These impacts could range from increases in suspended sediments and decreases in dissolved oxygen levels that could impact fish species using wetland habitats and in disruption of benthic habitats and organisms. Potential impacts on biological resources are discussed in Section 4.5. Impacts on water quality as a result of in-water construction would be temporary and localized, and because of their distance from the in-water construction areas, wetlands are expected to experience temporary and minor impacts. Potential impacts would be reduced through use of silt curtains and booms off of Berths 11, 12, and 13 and Dry Dock 3 during construction and the other measures to reduce impacts on water quality discussed under Surface Waters.

Based on the above, Alternative 1 would result in short-term and long-term minor impacts on wetlands. Based on the small area of the Piscataqua River that would be permanently impacted, no significant impacts on wetlands would result.

Floodplains

The proposed waterfront improvement projects would include construction work in a designated special flood hazard area. The Proposed Action would not result in an increase in impervious surface in the special flood hazard area. The upland Project area is entirely paved and would remain paved following construction. No new regularly inhabited structures would be constructed as a result of the Proposed Action. Therefore, the Proposed Action would have no impact on the floodplain in the Project area. No significant impacts on floodplains are expected as a result of the Proposed Action.

Marine Sediments

Dredging the construction footprints and installing and removing piles would temporarily disturb the seafloor in areas adjacent to Berths 11, 12, and 13. Construction of the bulkheads at Berths 11, 12, and 13 would result in permanent loss of an area of marine sediments not exceeding 11,185 square feet (0.26 acres). The remainder of the proposed fill would be deposited on the previously filled area beneath the fitting-out pier. The permanent loss of marine sediments would be insignificant on a landscape-scale, given the abundance of similar marine substrates in the surrounding estuary system that is of similar or better quality.

Indirect impacts on marine sediments in the Project area are likely to result from turbidity caused by dredging activities. The in-water construction areas would experience higher levels of turbidity than surrounding areas; however, finer sediments would be suspended in the water column and could settle on marine sediments in adjacent, undisturbed areas. As noted in Section 3.10, construction areas adjacent to Berths 11 and 13 are included in the Dry Docks Area of Concern (AOC) in Operable Unit (OU) 4 at the Shipyard, where sediments may have been contaminated with heavy metals, oils and grease, and metal-plating wastes from wastewater outfalls or polycyclic aromatic hydrocarbons (PAHs) from former storage areas located north of Dry Dock 1 and southeast of Dry Dock 3. No further remedial action was determined necessary to address contamination in sediments in areas of the Dry Docks AOC in the Project area. Therefore, the potential re-suspension and transport of sediments in in-water construction areas may have minor impacts on adjacent marine sediments, but no significant impacts are expected to result. Impacts on marine sediments that would result from the proposed in-water

projects would be similar to short-term impacts resulting from periodic maintenance dredging at the Shipyard. Within a short time after construction is complete, marine sediments would be expected to return to pre-construction conditions.

Minor disturbances of marine sediments from vessel propeller wakes and other vessel disturbances during operation of the berths would be similar to disturbances caused by past and current use of these facilities and would not represent a substantial change in the condition of marine sediments in the Project area.

Based on the above analysis, Alternative 1 would result in short- and long-term minor impacts on marine sediments. No significant impacts on marine sediments would result.

4.2.3 Alternative 2

Like Alternative 1, Alternative 2 would involve in-water construction and fill that would directly impact water resources. Alternative 2 would involve additional pile driving at Berths 11, 12, and 13 that would result in greater short-term impacts during construction. Construction and removal of a temporary cofferdam at the Dry Dock 3 caisson also would require pile driving and temporary fill in the Piscataqua River. Indirect impacts could result from general construction activities in upland parts of the Project area.

4.2.3.1 Potential Impacts

The Berths 11, 12, and 13 structural repairs proposed under Alternative 2 would result in short- and long-term impacts on water resources similar to those described under Alternative 1. However, because Alternative 2 would require additional pile driving, short-term impacts on water resources during construction would be greater in duration and intensity. These impacts would include impacts on surface water quality, wetlands, and marine sediments as a result of increased amounts of re-suspended sediments and turbidity, as well as the potential for decreases in dissolved oxygen levels over a larger area or for a longer duration. The discussion of impacts below focuses on the temporary impacts on water resources resulting from the construction and removal of a temporary cofferdam at Dry Dock 3 under Alternative 2.

Surface Waters

Under Alternative 2, the proposed Dry Dock 3 caisson replacement project would require construction of a temporary circular, cellular cofferdam outside of the caisson. Dewatering of the dry dock during construction would be accomplished using Dry Dock 3's existing pump, and dewatering operations would comply with the requirements of the Shipyard's existing MPDES permit and Maine Waste Discharge License.

The temporary cofferdam would occupy an estimated footprint of 7,458 square feet, including the area enclosed by the cofferdam (an estimated 1,981 square feet). Before the temporary cofferdam is constructed, sediment would be dredged from the cofferdam footprint. The total amount of dredging required would not exceed the volume limits the USACE has approved for the Shipyard's regular maintenance dredging. Dredged sediments would be analyzed for various contaminants and potentially tested for toxicity using the toxicity characteristic leaching procedure. (More information on the types of contaminants potentially occurring in areas off of Berths 11, 12, and 13 and potential impacts resulting from the Proposed Action is provided in Sections 3.10 and 4.10.) The toxicity levels of the dredged sediments would be compared with MEDEP Solid Waste Management Rules (Chapter 418) for Beneficial

Use of Solid Wastes to assess the sediments' suitability for use as fill material or for other construction purposes. If MEDEP thresholds for toxicity are not exceeded, the construction contractor may use the sediments for other construction uses; if levels for toxicity are exceeded, the dredged sediments would be dewatered and amended with concrete prior to disposal at an approved landfill in accordance with the Maine Solid Waste Management rules and regulations. Construction dewatering discharges will be required to comply with the Water Quality Certification issued by the MEDEP as part of the NRPA permitting process. Disposal of dredge spoils at an in-water disposal site is not being considered as part of the Proposed Action; therefore, no impacts on surface water quality would result from disposal of dredge spoils.

During dredging and construction of the temporary cofferdam, sediments in the immediate construction area would be re-suspended, resulting in temporary impacts on surrounding waters from increased turbidity and decreases in dissolved oxygen concentration. A silt curtain and booms would be installed outside of the cofferdam footprint during its construction and removal to contain re-suspended sediments within the immediate construction area. The area inside the containment boom would be cleaned of debris as needed to prevent water quality impacts during construction. In addition, use of the tremie concrete method, in which concrete displaces water from the area being filled, during construction of the temporary cofferdam would prevent concrete from becoming diluted and dispersing into surrounding waters. Therefore, water quality impacts during concrete placement are not expected.

Backfilling the cells and arcs of the temporary cofferdam may also result in temporary water quality impacts from turbidity, as fill sediments may escape the cofferdam during vibratory compaction. Turbidity impacts during compaction would be minor and localized, and suspended sediments would be expected to quickly settle out of the water column. Dewatering would begin once construction of the cofferdam is complete. The cofferdam cells and arcs would be dewatered, and water would be filtered through a sediment removal system before being discharged to the river. Collected sediments would be tested for toxicity and either used for construction purposes or disposed of at an approved landfill as described above.

The Navy will apply for a Category II USACE general permit under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for the proposed temporary fill associated with the temporary circular, cellular cofferdam. The Navy also will apply for an individual NRPA permit from the MEDEP for the proposed fill. Filling during construction of the temporary cofferdam will comply with the conditions of these permits. Compensatory mitigation for the loss of coastal habitat functions and values as a result of the proposed fill will occur in the form of an in-lieu fee paid to the Maine DEP prior to the start of construction in accordance with the Maine Natural Resources Protection Act (38 M.R.S.A. §480-Z), Sections 404 and 401 of the Clean Water Act (33 U.S.C. §1251 et seq.), and Section 10 of the Rivers and Harbors Act (33 U.S.C. §403 et seq.). The amount of compensatory mitigation required under Alternative 2 will be determined based on the total area of permanent and temporary fill at Berths 11, 12, and 13 and Dry Dock 3.

The work area inside the cofferdam would be kept dry through use of water control and dewatering pumps. Dewatering would remove any rainwater or snowmelt that infiltrates the cofferdam. Dewatering discharges would be treated in accordance with the Maine Erosion and Sediment Control Law and discharged to the Piscataqua River. A sediment removal system would be used to remove sediments from waters discharged to the river. Water treatment and sediment removal measures would remain in place until the cofferdam is disassembled.

The temporary cofferdam would be removed once the caisson replacement and seat repairs are completed. Temporary water quality impacts from turbidity during removal of the cofferdam would be similar to those described above. Removal of the fill material before the cofferdam is disassembled would minimize turbidity resulting from dredging. Once the temporary cofferdam is removed, the cofferdam footprint would be dredged to its final design depth, per USACE limits. Dredging would comply with the requirements of the Shipyard's joint USACE Maine General Permit and MEDEP NRPA permit for maintenance dredging. Dredged sediments would be tested for toxicity as noted above and would either be used for construction purposes if toxicity levels are below MEDEP thresholds or disposed of at an approved landfill as described above.

As noted under Alternative 1, limited upland work would be required at Dry Dock 3 to install the new caisson. Repairs to the dry dock or pier at this location would incorporate standard BMPs as described above and would comply with the Maine Erosion and Sedimentation Control Law. Erosion control measures would be installed prior to construction, and a soil and erosion control plan would be implemented to guide appropriate placement of control measures on the site.

Short-term impacts on surface waters under Alternative 2 would be greater than those under Alternative 1 because of the temporary fill at Dry Dock 3. However, because this fill would be temporary and surface water impacts during construction would be localized, Alternative 2 likewise would result in short- and long-term minor impacts on surface water. No significant short- or long-term impacts would result.

Wetlands

Alternative 2 would require temporary fill of an estimated 7,458 square feet of the Piscataqua River at Dry Dock 3, in addition to the total area of approximately 98,800 square feet to 118,800 square feet (with Option 1) that would be filled at Berths 11, 12, and 13. The total area of temporary and permanent fill under Alternative 2 would be approximately 106,258 square feet or 126,258 square feet (with Option 1). Impacts would be the same as those described under Alternative 1 but would occur across a larger area during construction. Direct and indirect impacts on wetlands as a result of fill and temporary impacts on water quality would end upon completion of construction. As noted, compensatory mitigation for the loss of coastal habitat functions and values as a result of the proposed fill will occur in the form of an in-lieu fee paid to the Maine DEP prior to the start of construction. Based on the above, Alternative 2 would result in short-term and long-term minor impacts on wetlands. Based on the small area of the Piscataqua River that would be permanently impacted, no significant impacts on wetlands would result.

Floodplains

Impacts on floodplains under Alternative 2 would be the same as those described under Alternative 1. Construction of a temporary cofferdam at Dry Dock 3 would not result in long-term changes to floodplains in or near the Project area. Therefore, no significant impacts on floodplains would result.

Marine Sediments

Dredging the construction footprints and installing and removing piles would temporarily disturb the seafloor in areas adjacent to Berths 11, 12, and 13 and Dry Dock 3. Construction of the bulkheads at Berths 11, 12, and 13 would result in permanent loss of an area of marine sediments not exceeding 11,185 square feet (0.26 acres). An additional estimated 7,458 square feet of marine sediments adjacent to Dry Dock 3 would be temporarily impacted by dredging and fill. The temporary and permanent loss of

marine sediments would be insignificant on a landscape-scale, given the abundance of similar marine substrates in the surrounding estuary system that is of similar or better quality.

Indirect impacts on marine sediments in the Project area are likely to result from turbidity caused by dredging activities at both project locations. Therefore, the potential re-suspension and transport of sediments in in-water construction areas may have minor impacts on adjacent marine sediments, but no significant impacts are expected to result for the reasons described under Alternative 1. Impacts on marine sediments that would result from the proposed in-water projects would be similar to short-term impacts resulting from periodic maintenance dredging at the Shipyard. Within a short time after construction is complete, marine sediments would be expected to return to pre-construction conditions.

Minor disturbances of marine sediments at both Project locations from vessel propeller wakes and other vessel disturbances during operation of the berths would be similar to disturbances caused by past and current use of these facilities and would not represent a substantial change in the condition of marine sediments in the project area.

Based on the above analysis, Alternative 2 would result in minor short- and long-term impacts on marine sediments. No significant impacts on marine sediments would result.

Overall, potential short- and long-term impacts on water resources under Alternative 2 would be minor. No significant impacts on water resources would result from Alternative 2.

Bathymetry Potential Impacts:

- No Action Alternative: No changes to bathymetry in the project area.
- Alternative 1: Minor impacts on bathymetry at Berths 11, 12, and 13 as a result of dredging and filling during construction. No effects on navigation in the Piscataqua River.
- Alternative 2: Minor impacts on bathymetry at Berths 11, 12, and 13 and Dry Dock 3 as a result of dredging and filling during construction. Fill at Dry Dock 3 would be temporary. No effects on navigation in the Piscataqua River.

4.3 Bathymetry

The bathymetry analysis considers the potential for the Proposed Action to impact the water depth in the Piscataqua River and, consequently, navigation in areas near the Project area.

4.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and there would be no changes in soils or in the bathymetry of the Project area. Therefore, no significant impacts on bathymetry would occur with implementation of the No Action Alternative.

4.3.2 Alternative 1 (Preferred Alternative)

Alternative 1 would involve in-water dredging and deposition of fill that may impact bathymetry. The study area for bathymetry includes the in-water Project area.

4.3.2.1 Potential Impacts

Construction of the bulkheads at Berths 11, 12, and 13 would require fill deposition primarily on previously filled land beneath the fitting-out pier, extending 5 feet beyond the existing berth faces. Fill would be deposited on approximately 98,800 square feet (2.27 acres)—the majority of which is previously filled land—if the bulkhead at Berth 11C is not constructed, and approximately 118,800

square feet (2.73 acres) if Option 1 is implemented and the Berth 11C bulkhead is constructed. Construction of the bulkheads would expand the fitting-out pier and permanently remove a small area of river bottom, not exceeding 11,185 square feet (0.26 acres) with implementation of Option 1. The permanent changes in bathymetry at the berths, which currently are dredged as part of the Navy's maintenance dredging program, would support the Shipyard's mission needs. The fill required to implement the Proposed Action would not affect navigation in the Piscataqua River because this area is within the restricted security perimeter of the Shipyard and outside of the federal navigation channel, and it would not impact use of the berths or Dry Docks 1 and 3.

The bulkheads would be placed slightly below the permitted dredge depth for the berths to prevent the bottom of the bulkhead from being undermined during future maintenance dredging. This would not impact bathymetry at the berths because the dredging required to seat the bulkheads would be limited to the bulkhead locations, and the bathymetry of adjacent areas would not be impacted.

Following completion of construction at Berths 11, 12, and 13, and Dry Dock 3, the bathymetry of adjacent areas of the river would not be impacted during normal operations. However, these berths and the dry dock entrance would continue to be dredged approximately every 10 years under the Shipyard's maintenance dredging program to maintain safe depths for navigation. Future maintenance dredging would comply with the requirements of the Shipyard's existing joint U.S. Army Corps of Engineers (USACE) Maine general permit/NRPA permit for maintenance dredging.

Based on the above, short- and long-term impacts on bathymetry would be minor. Alternative 1 would not affect navigation in the Piscataqua River; therefore, no significant impacts would result.

4.3.3 Alternative 2

4.3.3.1 Potential Impacts

The study areas and potential impacts on bathymetry under Alternative 2 resulting from the Berths 11, 12, and 13 structural repairs would be the same as those described for Alternative 1, the Preferred Alternative. Permanent impacts on bathymetry at Berths 11, 12, and 13 would result from removal of a small area of river bottom when constructing the bulkheads. The permanent changes to bathymetry at the berths, which currently are dredged as part of the Navy's maintenance dredging program, would support the Shipyard's mission needs and would not affect navigation in the Piscataqua River.

Replacement of the Dry Dock 3 caisson would temporarily impact bathymetry within the 25,000-square-foot limit of disturbance adjacent to the dry dock. Before the temporary cofferdam is constructed, sediment would be dredged from the cofferdam footprint, an estimated area of 7,458 square feet. The total amount of dredging required would not exceed the volume limits the USACE has approved for the Shipyard's regular maintenance dredging. Fill material, concrete, and grout would be added to the cells and arcs of the cofferdam to stabilize it; however, these materials would be removed during deconstruction and removal of the temporary cofferdam and would not cause any long-term impacts on bathymetry. Once the temporary cofferdam has been removed, the river bottom within the cofferdam would be dredged to its final permitted design depth, per USACE limits. Construction and removal of the temporary cofferdam would not affect navigation in the river because the site of the cofferdam is within the Shipyard's restricted security perimeter. Future maintenance dredging would comply with the requirements of the Shipyard's existing joint USACE Maine general permit/NRPA permit for maintenance dredging.

Short- and long-term impacts on bathymetry under Alternative 2 would be greater than those under Alternative 1 but still minor. Alternative 2 likewise would not affect navigation in the Piscataqua River; therefore, no significant impacts would result.

4.4 Cultural Resources

Analysis of potential impacts on cultural resources considers both direct and indirect impacts. Direct impacts may be the result of physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the importance of the resource; introducing visual, atmospheric, or audible elements that are out of character for the period the resource represents (thereby altering the setting); or neglecting the resource to the extent that it deteriorates or is destroyed. The Navy is considering these impacts in accordance with NEPA and Section 106 of the National Historic Preservation Act (NHPA).

Cultural Resources Potential Impacts:

- No Action Alternative: No change to existing cultural resources in the Project area.
- Alternative 1: Replacement of the Dry Dock 3 caisson would result in an adverse effect on Dry Dock 3, a contributing resource in the Portsmouth Naval Shipyard Historic District. The Navy is consulting with the Maine SHPO and ACHP regarding the finding of an adverse effect, and execution of a Memorandum of Agreement is anticipated.
- Alternative 2: Impacts under Alternative 2 would be similar to those under Alternative 1.

NEPA requires consideration of all cultural resources, including not only those that are historic properties but also those that are not. As part of this evaluation, therefore, direct and indirect impacts are considered for all known archaeological and architectural resources. Section 106 of the NHPA provides that federal agencies take into account the effects of their actions on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP) (i.e., a historic property). In accordance with Section 106 of the NHPA, the Navy also has evaluated the Proposed Action and alternatives to determine their effects on historic properties.

According to **36 CFR 800.16(d)** the area of potential effects is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The area of potential effects is influenced by the scale and nature of the undertaking and may be different for different kinds of effects caused by the undertaking.

4.4.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and there would be no change in existing cultural resources in the Project area, including archaeological resources, architectural resources, or traditional cultural properties. Therefore, no significant impacts on cultural resources would occur with implementation of the No Action Alternative.

4.4.2 Alternative 1 (Preferred Alternative)

In-water and upland construction activities, including dredging, filling, excavation, demolition, and new construction under Alternative 1 may result in impacts on cultural resources. As described in Section 3.4,

both of the proposed projects under Alternative 1 have an associated APE. The two APEs together make up the study area for potential impacts on cultural resources.

4.4.2.1 Potential Impacts

Historic Properties/Archaeological Resources

Berths 11, 12, and 13 Structural Replacement

The Navy has considered the potential impacts of Alternative 1 on archaeological resources within the APE for the Berths 11, 12, and 13 Structural Replacement project under NEPA. The APE for the Berths 11, 12, and 13 structural repairs is in an area of low archaeological sensitivity (Hardlines Design Company, 2012). The Marine Railway, however, is located within the southeastern portion of the APE; this site has been determined to be NRHP-eligible (Wheeler, 2010). This resource is located outside of areas where ground disturbance associated with this project is anticipated. As such, Alternative 1 would not have any direct impacts on this resource.

Portions of the quay wall system have been identified within the APE, near Building 174. This portion of the quay wall system has been recommended as eligible for listing on the NRHP. As a majority of the work would occur within the water, direct impacts on the quay walls are not anticipated to occur. Therefore, Alternative 1 is not expected to result in any impacts on archaeological resources.

The Navy has considered the potential effects of Alternative 1 on archaeological resources under Section 106 and has determined that Alternative 1 would have no effect on previously identified historic properties due to the potential for limited ground disturbance that is anticipated to occur within the vicinity of a known archaeological site and the quay wall system. The Navy is currently consulting with the Maine SHPO regarding this finding.

The Navy's ICRMP outlines procedures to handle an unanticipated discovery to ensure compliance with federal laws and regulations. An unanticipated discovery is defined as a discovery (usually archaeological) made during a construction project in an area that has already been adequately surveyed or deemed as not requiring survey, and the unanticipated discovery was not found during that survey (Hardlines Design Company, 2012). If a discovery is made, these procedures will be followed.

Dry Dock 3 Caisson Replacement

The Navy has considered the potential impacts of Alternative 1 on archaeological resources within the APE for the Dry Dock 3 caisson replacement project under NEPA. Alternative 1 would not have any direct impacts on known underwater or terrestrial archaeological sites at the Shipyard because none have been identified within the APE. Furthermore, the work done for this project would occur in an area that was filled in the early 1900s to create man-made land. Given the previous disturbance associated with activities occurring over time on the Shipyard and in its surrounding waters (i.e., dredging, land-forming activities, and moving currents), the APE is not located in an area deemed archaeologically sensitive (Hardlines Design Company, 2012).

Portions of the quay wall system have been identified within the APE, near Building 174. This portion of the quay wall system has been recommended as eligible for the NRHP. As a majority of the work would occur within the water, direct impacts on the quay walls are not anticipated to occur.

The Navy also has considered the potential effects of Alternative 1 on archaeological resources under Section 106 and has determined that Alternative 1 would have no effect on previously identified historic

properties due to the potential for limited ground disturbance that is anticipated to occur within the vicinity of the quay wall system. The Navy is consulting with the Maine State Historic Preservation Office (SHPO) regarding this finding of no effect.

Upon the discovery of an unanticipated find, the procedures outlined in the ICRMP will be followed (Hardlines Design Company, 2012).

Historic Properties/Architectural Resources

Berths 11, 12, and 13 Structural Replacement

The Navy has considered the potential impacts of Alternative 1 on architectural resources within the APE for the Berths 11, 12, and 13 structural repairs under NEPA. Alternative 1 would result in direct impacts on Berths 11 (A and B), 12, and 13 (A and B) and the fitting-out pier as well as indirect impacts on the visual setting of Dry Docks 1 and 3; Buildings 2, 92, 155 (scheduled for demolition), 175, 347, and WH 3; Berths 1, 11, 12, and 13; the historic crane and railroad system (including the historic crane rails) along these berths; and the surrounding NRHP-eligible historic district.

Direct impacts on Berths 11 (A and B), 12, and 13 (A and B) would result from enclosing these berths with king pile and concrete shutter panel bulkheads. Direct impacts on open areas of the fitting-out pier would result from removing existing concrete decking, wooden decking, and utilities; refilling the pier with compacted engineered fill material; resurfacing and restoring the pier with concrete; installing timber decking; and repairing existing corroded piles. The construction would occur in two phases.

Under Phase 1, the existing timber rub strips, fenders, and their support piles would be removed from Berth 11 (A and B), and a bulkhead would be constructed around this berth as well. Under Phase 2, the existing timber fenders and their support piles would be removed (timber piles would be removed from Berths 11A, 12, and 13A only), and a bulkhead would be constructed around Berth 12 and Berth 13 (A and B). Dredging, the installation of the king piles and shutters, and the setting of sister piles at the location of the inboard portal crane rail beam (at Berths 11 and 13, including Berth 11C) would occur as well. Construction of the bulkheads at Berths 11, 12, and 13 would result in moderate direct impacts on the pier structure.

The enclosure of Berth 11C through the implementation of Option 1 under Alternative 1 would not result in any other additional impacts. The work associated with this option would largely occur within the water. Under this option, the bulkhead installed at Berth 11C would extend from the western end of Berth 11B to the southern end of Berth 12; sister piles would be installed at the inboard rail beam, as previously noted.

No direct impacts on the historic crane and railroad system at these berths would be expected to occur during construction because the rails would be left in place and unaltered.

Alternative 1 also would result in indirect impacts on the visual setting of Dry Docks 1 and 3; Buildings 2, 92, 155 (scheduled for demolition), 175, 347, and WH 3; Berths 1, 11, 12, and 13; the historic crane and railroad system (including the historic crane rails) along these berths; and the surrounding NRHP-eligible historic district.

When the Project is completed, these structures would be indirectly impacted from the changes in the appearance to those portions of Berths 11, 12, and 13 that are visible above the waterline. The proposed bulkheads, however, would not change the overall appearance of the pier.

Modifications to the fitting-out pier and the berths would be consistent with the continuing use and alteration of this portion of the NRHP-eligible historic district as an active, industrial waterfront. The visual settings of some of the structures in the APE also have changed throughout the history of the Shipyard due to alterations of some of the structures themselves and those outside the APE. Therefore, no mitigation is required or proposed to address the indirect, visual impacts of Alternative 1, which would be minor overall because the Berths 11, 12, and 13 structural repairs would be consistent in appearance with the surrounding industrial waterfront.

Short-term, minor indirect impacts on these resources would result primarily from the presence of various types of construction equipment (e.g. bulldozers, backhoes, and trucks) and materials that would be temporarily visible within views of the Berths. Construction equipment and materials would be present within the APE only during construction and would be removed once construction is complete. Construction equipment and materials, while consistent with the industrial nature of the Shipyard, would be present to a greater degree in the APE and would be more noticeable during the construction period.

In accordance with Section 106, the Navy proposes that the structural repairs to Berths 11, 12, and 13 and to the fitting-out pier would have no adverse effect on historic properties. The characteristics of Berths 11, 12, and 13 that enable them to be contributing elements to the NRHP-eligible historic district would not be adversely affected by the Proposed Action because the overall shape and function of the fitting-out pier, which the berths enclose and are associated with, would remain the same. The fitting-out pier was constructed in the early 1940s to support the ramp-up of the construction of new submarines at the Shipyard during World War II and was modified substantially in 1960. The Project would improve the structural condition of the pier to allow for the continued operation of the Shipyard's portal cranes, which serve Dry Docks 1 and 3. Furthermore, the proposed Project would be reversible; the new bulkheads would not permanently alter the underlying pier structure. The Navy has further determined that the potential visual impacts resulting from Alternative 1 would have no adverse effect on historic properties that are architectural resources.

Therefore, the Berths 11, 12, and 13 Structural Replacement project would have no adverse effect on historic properties that are architectural resources. The Navy is consulting with the Maine SHPO regarding this finding.

<u>Dry Dock 3 Caisson Replacement</u>

The Navy has considered the potential impacts of Alternative 1 on architectural resources within the APE for the Dry Dock 3 caisson replacement under NEPA. Alternative 1 would result in direct impacts on Dry Dock 3, as well as indirect impacts on the visual setting of Dry Dock 3; Building 175 and WH 3; Berths 12 and 13; and the surrounding historic properties and NRHP-eligible historic district.

Direct impacts on Dry Dock 3 would result from removing and replacing the existing steel caisson and altering the design of the associated inner and outer caisson seats. The designs of the new caisson and repaired caisson seats would be modified from the existing designs because of changes in manufacturing technology and to improve operational efficiency, as well as to take into consideration the projected sea level rise in the lower Piscataqua River. Pursuant to EO 13653, Preparing the United States for the Impacts of Climate Change, which directs federal government agencies to begin preparedness planning, the Shipyard is proposing to make the caisson 1 foot taller in order to accommodate for just over 1 foot of sea level rise in the Piscataqua River. The dimensional change will also result in a slight change in width of 1 foot (6 inches into the dry dock and 6 inches into the river). In

addition, the change in height will also necessitate the addition of a step or ramp to access the caisson on the north and south ends. The Shipyard also is proposing a design change at both the inner and outer seats to accommodate the projected sea-level rise within the Piscataqua River. The caisson seats would have essentially the same design but would be constructed 1 foot higher than the current elevation.

As the replacement would alter the materials and design of this historically important structure, the Navy has determined that Alternative 1 would have a moderate direct impact on Dry Dock 3 under NEPA; however, this impact would be less than significant because the new caisson design generally would be similar in look and feel. It would not substantially change the overall look of the dry dock. The Navy had considered restoring the Dry Dock 3 caisson, but these repairs would not be sufficient to meet the requirements of the Naval Sea Systems Command Safety Certification Program without also causing a number of changes to the materials and design of the dry dock. Due to changes in manufacturing technology, in-kind replacement is not feasible and, furthermore, would not reduce the risk to dry dock operations resulting from the projected sea-level rise. The Navy anticipates that no other direct impacts on the other architectural resources within the APE would occur.

A containment boom also would be installed outside the in-water work area. The use of this temporary installation would not be anticipated to cause direct impacts on Dry Dock 3. It would create indirect impacts by adding a new element to the area within the dry dock. These impacts would be temporary and minimal.

Alternative 1 would also result in indirect impacts on the visual setting of Dry Dock 3; Building 175 and WH 3; Berths 12 and 13; and the surrounding historic properties and NRHP-eligible historic district. Temporary, indirect visual impacts would result during construction, as described for the Berths 11, 12, and 13 Structural Replacement Project, but would cease upon completion of construction.

Once constructed, when viewing Dry Dock 3, indirect impacts would result from changes in the appearance of the caisson and caisson seats that are visible above the waterline. Although the design of the caisson and the caisson seats would be altered, the overall appearance of these features generally would remain the same. Therefore, these indirect visual impacts would not be considered significant.

Furthermore, modifications to the caisson and caisson seats would be consistent with continued use of Dry Dock 3 as an active, industrial facility that continues to support the evolving mission of the Shipyard to overhaul and repair vessels for the fleet. The visual settings of the structures in the APE also have changed throughout the history of the Shipyard due to alterations of some of the structures themselves and those outside the APE. Therefore, the Navy proposes that no mitigation is required under NEPA to address the minor indirect, visual impacts of Alternative 1 on Dry Dock 3; Building 175 and WH 3; Berths 12 and 13; and the surrounding NRHP-eligible historic district because the Dry Dock 3 caisson replacement would be consistent in appearance with the surrounding industrial waterfront.

In consideration of its responsibilities under Section 106, the Navy has determined that the Dry Dock 3 caisson replacement would have an adverse effect on this historic property as a result of the actions that would damage the character-defining features of Dry Dock 3 as described above. As noted in Section 3.4, Dry Dock 3 is a contributing element of the Portsmouth Naval Shipyard Historic District under NRHP Criterion C.

The Navy also has determined that the indirect visual effects of Alternative 1 would have no adverse effect on historic properties that are architectural resources as the visual changes largely would be

temporary in nature due to the presence of construction activities and materials. Once the project is completed, the visual setting would largely be the same as before construction began.

The Navy is currently consulting with the Maine SHPO and the Advisory Council for Historic Preservation regarding the finding of an adverse effect to Dry Dock 3, and the execution of a Memorandum of Agreement between the Navy and the Maine SHPO is anticipated. As part of mitigation, the Shipyard proposes to develop a Maine Historic Engineering Record (MHER) for Dry Dock 3. Results of this consultation will be included as they become available.

4.4.2.3 Traditional Cultural Properties

No known traditional cultural properties have been identified within the Shipyard (Hardlines Design Company, 2012). Therefore, Alternative 1 would not be expected to result in any direct or indirect impacts to traditional cultural properties.

The Navy will consult with five federally recognized Native American tribes of Maine: the Aroostook Band of Micmac Indians, the Houlton Band of Maliseet Indians of Maine, the Indian Township Reservation of the Passamaquoddy Tribe of Maine, the Penobscot Tribe of Maine, and the Pleasant Point Reservation of the Passamaquoddy Tribe of Maine (Hardlines Design Company, 2012).

4.4.3 Alternative 2

In-water and upland construction activities, including dredging, filling, excavation, demolition, and new construction under Alternative 2 may result in impacts on cultural resources. The study area for potential impacts on cultural resources under Alternative 2 includes the same APEs described for the projects under Alternative 1.

4.4.3.1 Potential Impacts

Historic Properties/Archaeological Resources

<u>Berths 11, 12, and 13 Structural Replacement</u>

Similar to Alternative 1, Berths 11, 12, and 13 structural repairs under Alternative 2 are expected to result in no impacts on archaeological resources, including historic properties, described under Alternative 1. Alternative 2 differs from Alternative 1 in use of an in-water construction method requiring additional pile driving but would occur in the same locations. If Alternative 2 is implemented, the Navy will consult with the Maine SHPO regarding the effects of Alternative 2 on historic properties pursuant to Section 106 of the NHPA.

<u>Dry Dock 3 Caisson Replacement</u>

The Dry Dock 3 caisson replacement under Alternative 2 would result in no impacts on archaeological resources, including historic properties, for the reasons described under Alternative 1. Alternative 2 differs from Alternative 1 in that a temporary cofferdam would be constructed to create a dry work area for more extensive repairs to be completed to the outer caisson seat. As noted, no known underwater or terrestrial archaeological sites have been identified within the APE, which includes the potential site of the cofferdam. If Alternative 2 is implemented, the Navy will consult with the Maine SHPO regarding the effects of Alternative 2 on historic properties pursuant to Section 106 of the NHPA.

Historic Properties/Architectural Resources

Berths 11, 12, and 13 Structural Replacement

Alternative 2 would result in similar moderate direct and minor indirect impacts on Berths 11 (A and B), 12, and 13 (A and B) and the fitting-out pier as those identified above for Alternative 1, except that steel sheet-piles would be used to construct the bulkhead instead of concrete shutter panels. Both the steel sheet-piles and the concrete shutter panels would generally serve a similar purpose. Their main difference would be in appearance due to the characteristics of the material used to enclose the bulkhead. Similar to Alternative 1, the proposed bulkheads and alterations to the pier surface associated with Alternative 2 would not change the overall appearance of the pier.

If Alternative 2 is implemented, the Navy will consult with the Maine SHPO regarding the effects of Alternative 2 on historic properties pursuant to Section 106 of the NHPA.

Dry Dock 3 Caisson Replacement

Alternative 2 would result in similar moderate direct and minor indirect impacts on cultural resources to those of Alternative 1. Alternative 2 differs from Alternative 1 in that a temporary cofferdam would be constructed to create a dry work area for more extensive repairs to be completed to the outer caisson seat. If Alternative 2 is implemented, the Navy will consult with the Maine SHPO regarding the effects of Alternative 2 on historic properties pursuant to Section 106 of the NHPA.

4.4.3.2 Traditional Cultural Properties

No known traditional cultural properties have been identified within the Shipyard. Therefore, there would not be any direct or indirect impacts to any of these properties.

The Navy will consult with five federally recognized Native American tribes of Maine: the Aroostook Band of Micmac Indians, the Houlton Band of Maliseet Indians of Maine, the Indian Township Reservation of the Passamaquoddy Tribe of Maine, the Penobscot Tribe of Maine, and the Pleasant Point Reservation of the Passamaquoddy Tribe of Maine (Hardlines Design Company, 2012).

4.5 Biological Resources

This analysis focuses on estuarine wildlife and vegetation that are important to the function of the lower Piscataqua River ecosystem or are protected under federal or state law or statute. Terrestrial biological resources in the industrial upland portion of the Project area are not discussed in this section for the reasons summarized in the introduction to Chapter 3.

Biological Resources Potential Impacts:

- No Action Alternative: No change to marine biological resources.
- Alternative 1: Impacts on marine biological resources would be short term and minor during construction. In-water noise would not result in long-term adverse effects or significant impacts on marine mammals. Alternative 1 may affect, but is not likely to adversely affect, two ESA species, the Atlantic sturgeon and shortnose sturgeon.
- Alternative 2: Impacts resulting from increased pile driving would occur over a longer duration and affect a slightly larger area. Overall impacts would be similar to those under Alternative 1 and would be short term and minor.

4.5.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and there would be no change in marine biological resources. Therefore, no significant impacts on marine biological resources would occur with implementation of the No Action Alternative.

4.5.2 Alternative 1 (Preferred Alternative)

The study area for the analysis of effects on biological resources associated with Alternative 1 includes the areas directly or indirectly affected by in-water construction, including dredging and pile extraction and installation at Berths 11, 12, and 13 and underwater repair work at the Dry Dock 3 caisson. Within the Project area, this includes a 200-foot buffer around Berths 11, 12, and 13 and the Dry Dock 3 caisson (referred to as the Action Areas for the purposes of analyzing potential impacts on EFH and managed fish species), and an approximately 0.48-square-mile area in the lower Piscataqua River in which marine mammals may be affected by in-water construction noise (referred to as the Zone of Influence [ZOI]).

Underwater noise, or changes in water pressure, associated with pile extraction, drilling, and driving would occur for a total of 109 days for all activities associated with the Berth 11, 12, and 13 structural repairs under Alternative 1 (see Table 4.5-1). In-water construction would include impact pile driving, which produces pulsed sounds, and vibratory pile driving, which produces continuous sounds. In general, pulsed sounds have an increased capacity to induce physical harm to marine mammals and fish compared with continuous sounds (ICF Jones and Stokes and Illingworth and Rodkin, Inc., 2012).

Table 4.5-1 Pile Installation and Removal Activity for the Berths 11, 12, and 13 Structural Repairs under Alternative 1 (with Option 1)

Activity (Method)	*Pile Type*	*Piles Installed (Berth 11)*	*Piles Installed (12 & 13)*	*Piles Extracted (Berth 11)*	*Piles Extracted (12 & 13)*	*Number of Days*
Temporary Piles for Trestle System (vibratory)	14-inch steel H-type piles	64	64	-	-	32
King Piles (rock-socketed)	36-inch steel H-type piles	94	83	-	-	18[1]
Sheet Piles and Returns (vibratory)	24-inch steel sheet-piles	112	86	-	-	10[2]
Permanent Sister Piles (impact)	14-inch steel H-type piles	50	37	-	-	22[3]
Timber Piles (vibratory)	15-inch timber piles	7	13	77	116	27[4]
Total Duration						109

[1] King Piles estimate based on assumption of 10 piles per day (Navy response to technical questions).

[2] Sheet Piles estimate based on assumption of 20 piles in 8 hrs (i.e., one day) installed two at a time (Navy response to technical questions).

[3] Estimate based on assumption of one-hour transition and set up time, resulting in one pile per two hours and four piles per day (ICF Jones and Strokes and Illingworth and Rodkin, Inc. 2012).

[4] Estimate based on assumption of 30 minutes to drive each pile and 30-minute transition and set up time, resulting in 1 pile per hour and eight piles per day (ICF Jones and Strokes and Illingworth and Rodkin, Inc. 2012).

4.5.2.1 Potential Impacts

Marine Vegetation

Alternative 1 would result in both short-term direct impacts on marine vegetation and long-term impacts from loss of habitat. In-water activities would temporarily disturb substrate within the Project area and would result in direct impacts on marine vegetation within the bulkhead footprints from removal by dredging or burial in fluidized sediments during bulkhead construction. However, the species identified with the Project area are common, are known to occur in adjacent areas of the lower Piscataqua River, are not sensitive to anthropogenic disturbance, and have a dispersive life history; therefore, marine vegetation would be expected to rapidly recolonize disturbed areas. Most of the dredging and pile installation proposed at Berths 11, 12, and 13 would occur within the footprint of the fender piles that would be removed at Berths 11A, 12, and 13A, which would minimize impacts on benthic vegetation at these locations. The berths and entrance to Dry Dock 3 have historically been dredged as part of a periodic maintenance dredging program to maintain safe operating depths for ships; thus, the impacts on marine vegetation that would result from in-water construction under Alternative 1 would be similar to those occurring during periodic maintenance dredging.

Construction of the bulkheads at Berths 11, 12, and 13 would result in the permanent loss of approximately 98,800 square feet (2.27 acres) of benthic habitat if the bulkhead at Berth 11C is not constructed and 118,800 square feet (2.73 acres) if the bulkhead at Berth 11C is constructed. The benthic habitat that would be permanently removed is beneath and adjacent to the existing berths along the Shipyard's industrial waterfront and is regularly disturbed as a part of maintenance dredging to maintain safe navigational depths at the berths. Further, vessel activity at the berths creates minor disturbances to benthic habitats (e.g., vessel propeller wakes) during waterfront operations.

The lower Piscataqua River supports a variety of estuarine habitats and aquatic life (New Hampshire Fish and Game Department [NHFGD] 2011), including sheltered habitat around neighboring islands that is less disturbed compared with the developed and industrialized areas surrounding the Shipyard, and suitable benthic habitat for marine vegetation close to the Project area is abundant. Further, marine vegetation could colonize fixed structures such as the Berth 11, 12, and 13 bulkheads. Thus, the bulkheads, once constructed, would be expected to provide habitat for species similar to those that currently occur in the Project area.

In-water work at Dry Dock 3 would not remove marine vegetation and would only temporarily disturb vegetation and increase turbidity in the water column. Disturbed vegetation would be expected to rapidly return to pre-construction conditions. Increased water column turbidity during construction would reduce light reaching benthic vegetation, which could temporarily reduce photosynthetic production. However, increased turbidity would be short-term and would not represent a significant change in baseline operational impacts from vessel disturbances.

Overall, minor short-term direct impacts on marine vegetation would occur during in-water construction, and negligible long-term impacts would result from loss of habitat and operation of the berths and Dry Dock 3. The proposed action would not result in significant impacts on marine vegetation.

Marine Mammals

Thresholds and Criteria for Pile Driving

Under the MMPA, NOAA Fisheries Service has established threshold levels to determine when impacts to marine mammals have occurred (see Table 4.5-1) (NMFS, 2005). Level A harassment (injury) takes are defined as activities that have the potential to injure a marine mammal or marine mammal stock in the wild and produce in-water noise thresholds of 180 dB root mean square (rms) re 1µPa for cetaceans and 190 dB rms re 1 µPa for pinnipeds for both impulse and continuous sounds. Level B harassment (disturbance) takes are defined as activities that result in behavioral disturbance of marine mammals and have in-water noise thresholds of 160 dB rms re 1 µPa for pulsed sounds and 120 dB rms re 1 µPa for continuous sounds for both cetacean and pinniped species.

Pile driving also can generate airborne noise that could potentially result in disturbance of marine mammals (pinnipeds) hauled out or at the water's surface. The appropriate airborne noise thresholds for behavioral disturbance for all pinnipeds, except harbor seals, is 100 dB re 20 µPa rms (unweighted) and for harbor seals is 90 dB re 20 µPa rms (unweighted) (see Table 4.5-2).

Table 4.5-2 Injury and Disturbance Thresholds for Underwater and Airborne Sounds

Marine Mammal Functional Hearing Group	***Airborne Marine Construction Criteria (Impact & Vibratory Pile Driving) (re 20 µPa)***	***Underwater Vibratory Pile Driving & Drilling Criteria (e.g., non-pulsed/continuous sounds) (re 1 µPa)***		***Underwater Impact Pile Driving Criteria (e.g., pulsed sounds) (re 1 µPa)***	
	Distance Guideline Threshold (Haul out)[1]	***Level A Injury Take Threshold***	***Level B Disturbance Take Threshold***	***Level A Injury Take Threshold***	***Level B Disturbance Take Threshold***
Cetaceans (whales, dolphins, porpoises)	N/A	180 dB rms	120 dB rms	180 dB rms	160 dB rms
Pinnipeds (seals, sea lions, walrus; except harbor seal)	100 dB rms (unweighted)	190 dB rms	120 dB rms	190 dB rms	160 dB rms
Harbor seal	90 dB rms (unweighted)	190 dB rms	120 dB rms	190 dB rms	160 dB rms

[1] Sound level at which pinniped haul-out disturbance has been documented. Not an official threshold, but used as a guideline.

Potential Responses to Underwater Pile Driving

Marine mammals' responses to pile driving depend on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the pile driving sound; the depth of the water column; the substrate of the habitat; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Responses vary in degree based on 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 the animal is 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. The

two potential types of responses, physiological responses and behavioral responses, are discussed below.

Physiological Responses.

Physical responses to continuous or impulsive sound may range from mechanical vibration or compression of tissues with no resulting injury to tissue trauma and 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 (Ketten, 1995). Sub-lethal impacts include hearing loss, which is caused by exposure to perceptible sounds. Severe damage to the ear can include injuries to tissues and hearing structures, hemorrhage, and cerebrospinal fluid leakage (NMFS, 2008). Moderate injury implies partial hearing loss. Permanent hearing loss can also occur when the hair cells in the ear are damaged by one very loud event or by prolonged exposure to noise. Temporary loss of hearing sensitivity has been documented in controlled settings using captive marine mammals exposed to strong sound exposure levels at various frequencies (Ridgway et al., 1997; Kastak et al., 1999; Finneran et al., 2005), but it has not been documented in wild marine mammals exposed to pile driving.

Behavioral Responses.

Behavioral responses to sound are highly variable and context specific. 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 (Richardson et al., 1995; National Research Council, 2003; Wartzok et al. 2003/04). While habituation to noise is possible, animals are most likely to habituate to sounds that are predictable and unvarying (Wartzok et al., 2003/04).

With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short term changes in an animal's typical behavior and/or avoidance of the affected area. A marine mammal may show signs that it is startled by the noise, swim away from the sound source and avoid the area, increase swimming speed, increase surfacing time, and/or decrease foraging in the affected area (Ridgway et al., 1997; Finneran et al., 2003; Morton and Symonds, 2002; CALTRANS, 2001, 2006; also see reviews in Gordon et al., 2004; Wartzok et al., 2003/04; and Nowacek et al., 2007). Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (CALTRANS, 2001, 2006).

Zone of Influence for the Berths 11, 12, and 13 Structural Repairs

Alternative 1 would involve a total of 109 days of in-water pile installation and removal activities, including drilling, vibratory pile driving, and removal, and impact pile driving. Acoustic modeling was used to determine the area (or ZOI) exposed to in-water sound pressure levels (SPLs) during in-water work that would exceed the criteria in Table 4.5-1. Appendix F provides details on the methodology used for acoustic modeling.

The modeled ZOI for construction at Berths 11, 12, and 13 is shown on Figure 4.5-1. The total area exposed to noise levels exceeding the designated NOAA Fisheries Service thresholds for Level B harassment (behavioral) take under Alternative 1 would be 0.45 mi^2 (290.12 acres). As shown on the figure, the numerous land features and islands within the vicinity of the Project area in the Piscataqua River would limit the area of sound exposure. Additionally, construction would occur in phases, and the ZOI for construction at Berths 11 and 13 would be smaller than the combined ZOI shown because land features at the Shipyard would block some of the in-water sound.

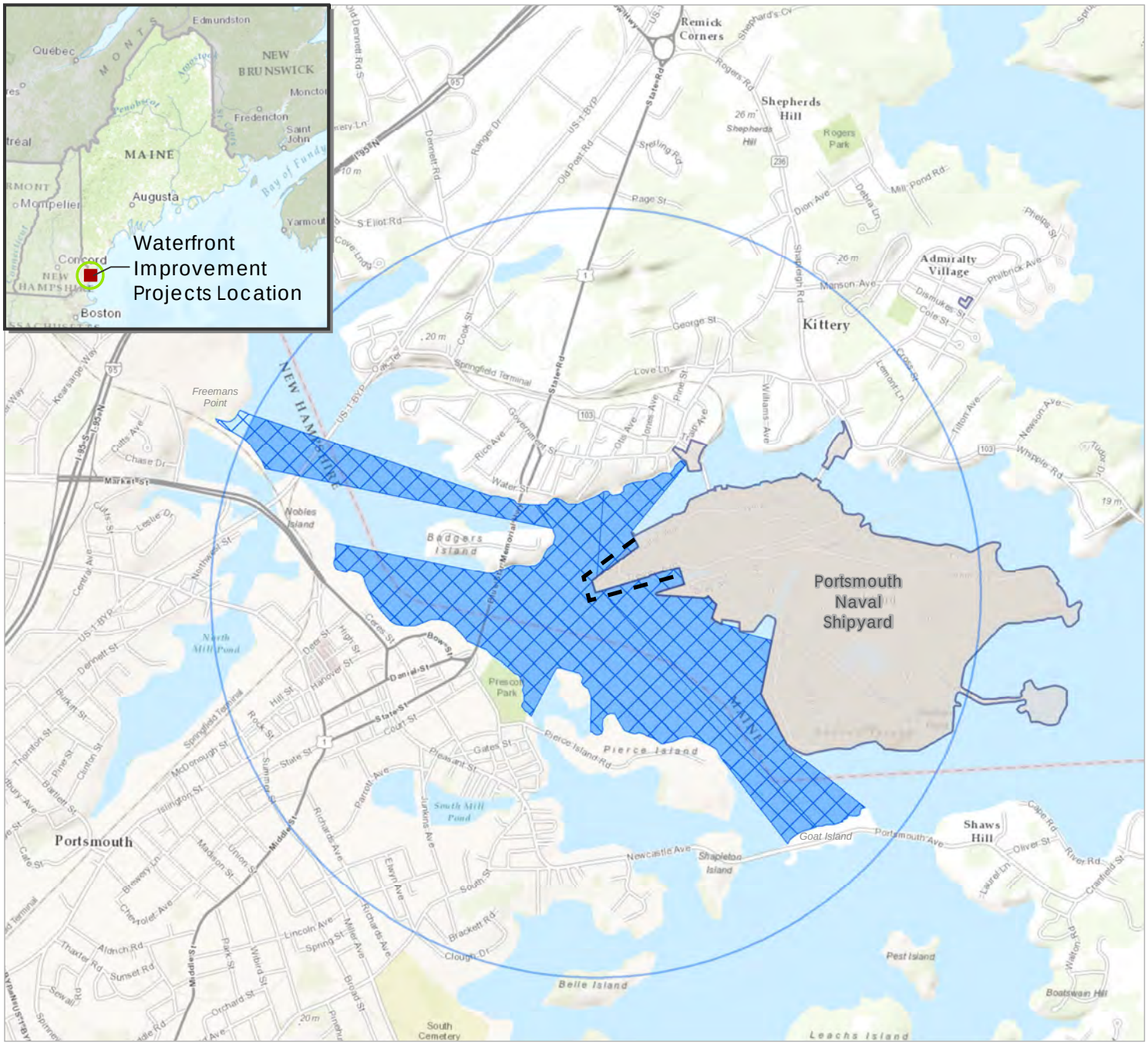

Figure 4.5-1
Combined Zones of Influence
for Underwater Vibratory
and Underwater Impact Hammer
Portsmouth Naval Shipyard
York County, Maine

Legend

- Zone of Influence for Underwater Vibratory Hammer
- Zone of Influence for Underwater Impact Hammer
- 0.98 mi (1.58 Km) Radius
- 4.57 mi (7.35 Km) Radius
- 15.53 mi (25.12 Km) Radius
- Installation Area

N

0 1,000 2,000 3,000 4,000 Feet

Source: ESRI 2013; Department of Defense 2014.

Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\EA\Figure_4_5_1_ZOI_120db_160db_All_Sites.mxd 1/25/2016

Conclusions Regarding Impacts on Species or Stocks

For several reasons, no physiological responses or injuries to marine mammals are expected from underwater noise generated by pile driving operations during the Berths 11, 12, and 13 structural repairs. First, vibratory pile driving, which would be used as the primary installation method, does not generate high peak SPLs that are commonly associated with injury. The sound that would be generated from the proposed vibratory pile driving is non-pulsed (e.g., continuous), which is not known to cause injury to marine mammals.

Impact pile driving has been minimized under Alternative 1 and would only occur over a short period of time during installation of the 14-inch steel H-type sister piles. While the Project would involve impact pile driving that would exceed acoustic thresholds for Level A takes, no Level A takes are expected because noise would attenuate below the pinniped injury threshold of 190 dB rms at a distance of 282 feet (85.9 m), and below the 180 dB RMS injury threshold for cetaceans at 52 feet (15.8 m). These very small areas can easily be monitored for marine mammals, and mitigation measures could be implemented to ensure that no Level A takes occur.

Additionally, the mitigation measures (discussed below) that will be used would greatly reduce the chance that a marine mammal may be exposed to SPLs that could cause physical harm.

Underwater noise generated by in-water construction would have the potential to disturb or displace small numbers of marine mammals. Individual marine mammals may be exposed to SPLs during pile driving, extraction, and drilling at Berths 11, 12, and 13 that may result in Level B harassment (behavioral) takes. Any marine mammals that are taken (harassed) may change their normal behavior patterns (i.e., swimming speed, foraging habits, etc.) or be temporarily displaced from the Project area. Since pile driving would likely only occur for a few hours a day and intermittently over the entire construction period for Phases 1 and 2 of the Berths 11, 12, and 13 structural repairs, pile driving is unlikely to result in permanent displacement from the Project area. Any Level B harassment (behavioral) takes would have only a minor effect on individuals and no effect on populations due to the low marine mammal densities and small area of impact in the lower Piscataqua River.

The Navy submitted an Incidental Harassment Authorization (IHA) application to NOAA Fisheries Service for the first year of construction under Alternative 1 on February 10, 2016. Based on the modeling results presented in the IHA application (see Appendix F) for the first year of construction, in-water construction under Alternative 1 is not expected to have any detectable adverse impact on population recruitment, survival, or recovery. The exposures outlined in Appendix F represent the maximum expected number of marine mammals that could be exposed to in-water sound reaching Level B harassment (behavioral) levels.

The Navy will employ a number of mitigation measures in an effort to minimize the number of marine mammals potentially affected by in-water sound during construction. The IHA application (see Appendix F) describes the mitigation management plan that will be implemented to minimize acoustic impacts on marine mammals. The IHA application addresses only the first year of construction, and the Navy will submit subsequent IHAs including similar mitigation measures to request additional takes for each year of in-water construction. Considering the low marine mammal densities in the area and the small area of impact, the numbers of marine mammals potentially affected by construction activities in subsequent years of the project will likely be minimal, consistent with the numbers potentially affected during the first year (see Appendix F).

With regards to airborne noise, there are no known haul-out sites for any pinniped species within the vicinity of the Project area. The closest known seal haul-out site within the Piscataqua River is 1.5 miles downstream of the Project area. Initial noise propagation modeling indicated in-air noise from pile-driving and extraction would attenuate below the distance thresholds for pinniped haul-out sites before reaching this distance. Therefore, Alternative 1 would not cause acoustic disturbance for pinniped species while hauled out.

In-water construction at Berths 11, 12, and 13 may temporarily displace marine mammals and their prey from the Project area in the vicinity of these berths as a result of underwater noise and turbidity. However, it is not expected that any of these impacts would be significant. It is not expected that there would be a notable direct loss of habitat available to marine mammals due to any of the activities associated with the projects. The habitat that would be permanently removed as a result of construction of the bulkheads is adjacent to and beneath Berths 11, 12, and 13 and is regularly disturbed during industrial waterfront operations at the Shipyard. Marine mammals using habitat near the Project area are primarily transiting the area; no known primary foraging or haul-out areas are located in or within 1.5 miles of the Project area.

Given the short daily duration of noise associated with individual pile driving and removal and the relatively small areas that would be affected, pile driving and extraction activities associated with Alternative 1 are not likely to have a permanent, adverse effect on any EFH, or population of fish species (see the sections below for additional discussion). Therefore, pile driving and removal would not have permanent, adverse effects on marine mammal foraging habitat.

In-water construction at the Dry Dock 3 caisson would result in negligible impacts on marine mammals. Pressure washing and repairing the outer caisson seat would generate some in-water noise, but the level of noise would be consistent with existing background in-water noise in the vicinity of the Shipyard (discussed in Section 3.5). While in-water construction activities at Dry Dock 3 may displace marine mammals and their prey from the Project area, this displacement would be temporary and would cease once construction is complete. No long-term impacts on marine mammals, prey species, or their habitat would result from the Dry Dock 3 caisson replacement.

Overall, Alternative 1 would result in minor short-term impacts on marine mammals because of the potential for behavioral harassment of small numbers of marine mammals during construction. This alternative is not expected to result in any long-term, adverse impacts on marine mammals, and no significant impacts on marine mammals are expected.

Fish

Potential impacts on fish, including managed EFH species (as defined in Appendix G: Essential Fish Habitat Assessment for the Waterfront Improvement Projects [NOTE: This appendix will be included once consultation is complete.]), would result primarily from temporary re-suspension of bottom sediments during dredging of the bulkhead footprint, noise generated during installation and removal of piles, and permanent loss of habitat at Berths 11, 12, and 13. These impacts are described below and, under Alternative 1, would occur primarily within the Action Area associated with the Berths 11, 12, and 13 structural repairs (see Figure 4.5-2).

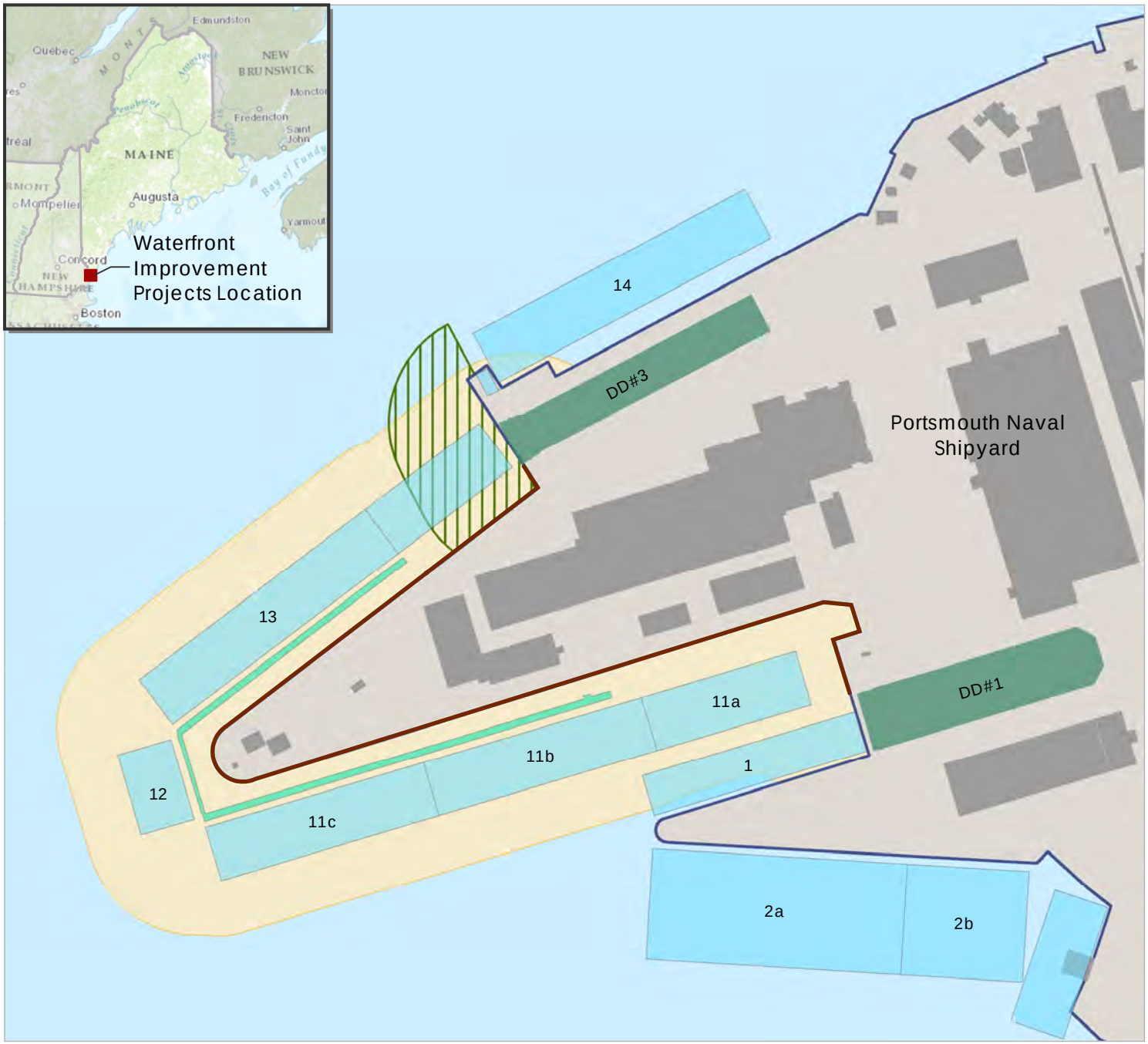

Figure 4.5-2
Action Areas at Berths 11, 12, and 13 and Dry Dock 3
Portsmouth Naval Shipyard
York County, Maine

Legend

- Existing Bulkhead
- Dry Dock
- Berth
- Existing Edges of Pier
- Existing Structures
- Installation Area

Action Area

- Dry Dock 3 Caisson Replacement
- Berths 11, 12, and 13 Structural Repairs

N

0 100 200 300 400 Feet

Source: ESRI 2013; Department of Defense 2014.

Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\EA\Figure_4_5_2_StructuralRepairs_DryDock3_CaissonReplacement.mxd

Turbidity

Sediment disturbance would temporarily increase turbidity within the water column during dredging, trenching, and pile driving and extraction at Berths 11, 12, and 13. Increased turbidity may impair the ability of sight-feeding fish to feed in the area immediately surrounding construction areas. Turbidity can also decrease the dissolved oxygen concentration in the water column, which could specifically affect egg and larval life stages of fish species. These life stages are unable to avoid areas where turbidity may be increased and therefore may be directly affected by reduced dissolved oxygen. Also, turbidity can clog the gills of any fish within the plume area that are unable to move away from the disturbance.

Turbidity plumes associated with dredging, trenching, and pile driving and extraction at the berths would be of short duration and diffuse rapidly due to the dynamic nature of the estuarine environment and the grain size of the material being removed. Sediment in the Action Area primarily consists of soft mud, sand, pebbles, and old mussel shells in areas of low energy and hard sand, pebbles/cobbles, and small boulders in areas of higher current flow (CR Environmental, Inc., 2014). The coarser grain sizes would be expected to settle out of the water column fairly quickly and remain close to the area of disturbance, whereas finer mud and sand sediments would remain suspended for a longer period (USEPA, 1999). However, because the lower Piscataqua River is a dynamic coastal area, riverine flushing and tidal action are expected to rapidly disperse and dilute turbidity, and therefore the area is expected to quickly return to background-level concentrations of suspended sediments (Reynolds et al., 1990).

Increased turbidity also would be possible during backfilling of the Berths 11, 12, and 13 bulkheads. Geotextile fabric would be installed against the interior of the bulkheads to minimize the amount of debris, sediment, and silt escaping the bulkheads during backfilling. In addition, a temporary silt curtain and boom would be installed outside of the bulkhead, approximately 18 feet off of Berths 11 and 13, to catch debris, sediment, and silt that may escape the bulkhead during backfilling. (Due to swift tidal currents at Berth 12, a silt curtain will not be used at this location.) Use of the geotextile fabric and temporary silt curtain and boom would minimize potential impacts on fish as a result of turbidity.

Similar to activities associated with construction of the berths, sediment disturbance could occur during in-water construction at Dry Dock 3 and temporarily increase turbidity, which could impact early life stages of fish. Turbidity increases at Dry Dock 3 would be short-term and controlled by a silt curtain and containment boom. Construction at Dry Dock 3 would occur in conjunction with activities at the berths, and, therefore, based on the overlap in construction schedule and Action Areas, turbidity associated with the Dry Dock 3 repairs would be masked by the greater impacts associated with dredging and pile driving activities at the berths. Once construction is complete, temporarily disturbed areas would naturally return to their pre-construction state.

Underwater Noise

The impacts of underwater sound on fish could be pathological, physiological, and/or behavioral, including physical damage, stress, and avoidance behavior (ICF Jones and Stokes and Illingworth and Rodkin, Inc., 2012). Fish with swim bladders would be more vulnerable to such pressure changes, which can cause capillaries to rupture or the swim bladder to rapidly expand and contract, leading to a temporary inability to control buoyancy (ICF Jones and Stokes and Illingworth and Rodkin, Inc., 2012). Temporary loss of hearing also may occur as a result of exposure to noise from impact pile driving (Popper and Hastings, 2009; Popper et al., 2005). In addition, sound can induce generalized stress responses in fish, particularly a startle response during initial activity, which can in turn induce

behavioral changes such as site avoidance throughout the remainder of pile-driving activities (Wysocki et al., 2006).

The extent to which fish react varies among species, their life stage, and with other environmental conditions. A cooperative effort between several federal and state transportation and resource agencies along the West Coast of the U.S. resulted in the establishment of interim criteria for the onset of physical injury to fishes exposed to the underwater sounds generated by impact pile driving (Stadler and Woodbury, 2009). The onset of physical injury uses dual criteria of SPL and cumulative sound exposure level (SEL), with injury expected to occur if either of these criteria are exceeded. A potential onset of physical injury is determined if either the peak SPL exceeds 206 dB relative to 1 micropascal (dB re 1 µPa) or the SEL, accumulated over all pile strikes generally occurring within a single day, exceeds 187 dB re 1 µPa squared per second (dB re 1 μPa^2/sec) for fishes 2 grams or larger, or 183 dB re 1 μPa^2/sec for smaller fishes. Adverse behavioral effects occur at a threshold of 150 dB re 1 µPa RMS (Stadler and Woodbury, 2009).

The intensity of pile-driving sound is greatly influenced by factors such as the types of piles and hammers and the physical environment in which the driving activity takes place. In order to determine reasonable SELs that would be likely to result from pile driving during the Berths 11, 12, and 13 structural repairs, studies of pile-driving operations with similar properties to the Proposed Action were evaluated. Pile-driving noise associated with the proposed in-water projects would be expected to range from 170 to 178 dB SEL for impact pile driving and 150 to 171 dB SEL for vibratory pile driving and extraction (ICF Jones and Stokes and Illingworth and Rodkin, Inc., 2012). Reference source levels assumed to be representative of the piles for the waterfront improvement projects are defined and described in the EFH Assessment (Appendix G). [NOTE: This appendix will be included once consultation is complete.]

Pile driving would generate underwater noise that potentially could result in disturbance of fish in and near the Action Areas. The intensity of this acoustic pressure wave would decrease as it propagates out from a source until the peak SPL and cumulative SEL drop below the calculable threshold values. A multi-step modeling approach was used to estimate the distance from piles where these measures drop below injury threshold values for fish (Stadler and Woodbury 2009). This modeling approach is described and modeling results for each pile-driving and extracting activity are presented in Appendix G. [NOTE: This appendix will be included once consultation is complete.]

Based on this modeling, underwater sound from vibratory hammering would attenuate to the injury threshold for the smallest size-class of fish at a maximum of 230 feet, and sound would attenuate to below the behavioral threshold at a maximum of 245 feet. The acoustic pressure wave generated from impact hammering would attenuate to injury threshold by 300 feet, with behavioral impacts on fish experienced up to 4,460 feet (0.8 mile) from the point of impact-hammer installations. The attenuation distances calculated are based on open-water conditions; however, the Shipyard is located in an area with significant topographic features that would prevent some of the sound propagation. Therefore, these distances are conservative.

Based on reference sound level data and established criteria for physical injury, the proposed in-water construction activities are expected to cause only localized pathological or physiological impacts on fish. However, behavioral changes in fish, including temporary displacement to adjacent habitats, would extend up to 0.8 mile from the Action Area as a result of the most significant noise-producing in-water construction. As noted in Section 4.5.2.1, the Great Bay National Wildlife Refuge and less-disturbed

habitats around islands in the lower Piscataqua River would provide ample foraging habitat and shelter for fish displaced from the Action Area during in-water construction. While pile driving and extraction would displace EFH species and other fish, the Navy would minimize the amount of pile driving required to the extent practicable under Alternative 1 by using concrete shutter panels and drilled king piles as the primary method of constructing the bulkheads.

Loss of Pelagic Habitat

Pelagic (open water) habitat within the footprints of the bulkheads at Berths 11, 12, and 13 would be permanently replaced with physical structures. Based on water column depths of between 17 and 40 feet at the locations of the bulkheads, the Proposed Action would result in the removal of 2.0 to 4.8 million cubic feet of open water. This open water habitat is adjacent to the Shipyard's industrial waterfront and is regularly subjected to vessel noise and wakes. Further, pelagic species are, by definition, mobile and typically range throughout the bay and estuary systems they inhabit in response to localized physical and chemical conditions as well as prey availability. Due to the regular vessel and other industrial operations at the Shipyard, the pelagic habitat that would be impacted is regularly disturbed, subjected to localized degradation in water quality, and not expected to support pelagic species beyond those transiting the area. Thus, the permanent loss of pelagic habitat as a result of the Proposed Action would be negligible.

Benthic Invertebrates

In-water construction activities would temporarily disrupt communities of benthic epifauna/infauna, including benthic communities that are designated EFH for managed fish species, near Berths 11, 12, and 13. The benthic habitat underneath the existing pier structure where the construction activities would be focused is predominantly soft mud transitioning to sandy substrates farther from the pier. During the 2014 benthic survey of the Project area, sand shrimp were the dominant species recorded, with other benthic invertebrates, such as the sea star (*Asteria vulgaris*), blue mussel (*Mytilus edulis*), branched hydroid (*Hydroza* spp.), orange sheath tunicate (*Botrylloides violaceaus*), sea anemone (*Metridum senle*), Jonah crab (*Cancer borealis*), and rock crab, also observed.

Dredging activities would temporarily fluidize benthic sediments, resulting in direct mortality of less motile benthic invertebrates, such as polychaetes and bivalves (e.g., mussels, clams). Areas that would be temporarily disturbed during construction are expected to recolonize with similar benthic communities composed of organisms or offspring of organisms from adjacent benthic areas.

Indirect impacts on benthic organisms would result from turbidity caused by dredging and trenching activities. The area within the construction footprint would likely experience higher levels of turbidity than the surrounding area; however, finer sediments would be suspended in the water column and could settle on benthic communities in adjacent, undisturbed areas. Suspension feeders (i.e., bivalves) and surface deposit feeders (i.e., polychaetes) would be the most susceptible to burial. However, it is expected that these impacts would be minor and temporary in nature. Benthic communities are very resilient to habitat disturbance and would likely recover to pre-disturbance levels within two years or less of the completion of construction (Brooks et al., 2006; Diaz et al., 2004).

Replacement of the Dry Dock 3 cofferdam under Alternative 1 would have negligible impacts on benthic invertebrates. Individual animals may be removed and killed during pressure washing of the outer caisson seat. Indirect impacts on benthic invertebrates in areas surrounding the Dry Dock 3 caisson as a

result of increased turbidity or burial may occur but would be expected to be negligible, since no new in-water construction or substantial sediment disturbance would be required under this alternative.

Prior to the beginning of in-water construction at Berths 11, 12, and 13 and the Dry Dock 3 caisson, lobsters within the in-water construction areas will be physically removed and relocated to mitigate possible injury or loss of individuals. Trapping through the use of ventless traps will be completed at each project site not more than two weeks prior to the start of in-water construction. All lobster relocation plans will be coordinated with the MEDMR prior to implementation.

In summary, there would be short-term and minor direct and indirect adverse impacts on benthic invertebrate species in and adjacent to Berths 11, 12, and 13 and Dry Dock 3 during construction as a result of disturbance of the benthos and associated turbidity. However, the impacts that would result from the proposed in-water construction activities would be similar to those resulting from maintenance dredging at the Shipyard. Within a short time after construction is complete, temporarily disturbed areas would to return to pre-construction conditions, allowing the recolonization of benthic invertebrates. Long-term impacts on benthic invertebrate species would result from permanent loss of benthic habitat at Berths 11, 12, and 13, as discussed below. These impacts would be minor. No significant impacts on benthic invertebrate species would result from Alternative 1.

Benthic Habitat

Dredging construction footprints and installing and removing piles would temporarily disturb the seafloor near Berths 11, 12, and 13. The primary temporary impact on benthic habitats during construction would be disruption of the benthos and temporary fluidization of sediments, resulting in temporary loss of benthic habitat. Impacts on benthic habitat would be avoided to the extent practicable by minimizing the construction footprint (see Section 5.4, Marine Vegetation). Indirect impacts on benthic habitat during construction are likely to result from turbidity and re-suspended sediments caused by dredging activities. The area within the construction footprint could have higher levels of turbidity than the surrounding area. However, it is expected that these impacts would be minor and temporary as the benthos is expected to naturally recover to pre-construction conditions in a short period of time.

While temporarily disturbed habitats would quickly return to their pre-construction conditions, construction of the bulkheads at Berths 11, 12, and 13 would result in permanent loss of approximately 98,800 square feet (2.27 acres) of benthic habitat if the bulkhead at Berth 11C is not constructed and 118,800 square feet (2.73 acres) if the bulkhead at Berth 11C is constructed. The benthic habitat that would be permanently removed is adjacent to and beneath the existing berths along the Shipyard's industrial waterfront, includes existing fill material beneath the fitting out pier, and is regularly disturbed as a part of maintenance dredging to maintain a safe navigational depth at the berth. Further, vessel activity at the berths creates minor disturbances to benthic habitats (e.g., from vessel propeller wakes) during waterfront operations.

The lower Piscataqua River supports a variety of estuarine habitats and aquatic life (NHFGD 2011), including sheltered habitat around neighboring islands that is less disturbed compared with the developed and industrialized areas surrounding the Shipyard. Therefore, suitable benthic habitat is abundant close to the Action Area, and displaced species would be expected to find ample forage and shelter in nearby undisturbed areas. The bulkheads, once constructed, also would be expected to provide habitat for sessile benthic species similar to those currently occurring in the Project area.

Compensatory mitigation for the loss of coastal habitat functions and values will occur in the form of an in-lieu fee paid to the Maine DEP prior to the start of construction at Berths 11, 12, and 13 in accordance with the Maine Natural Resources Protection Act (38 M.R.S.A. §480-Z), Sections 404 and 401 of the Clean Water Act (33 U.S.C. §1251 et seq.), and Section 10 of the Rivers and Harbors Act (33 U.S.C. §403 et seq.). The total fee will be determined by the total area of fill in the Action Area for the project.

Repair of the outer caisson seat at Dry Dock 3 would not impact benthic habitat beyond negligible short-term turbidity increases. Repair of the outer caisson seat and replacement of the Dry Dock 3 caisson would not result in any short- or long-term direct impacts on benthic habitat surrounding the dry dock.

In summary, there would be temporary and minor direct and indirect adverse impacts on the quality of benthic habitat in and adjacent to the Action Area during construction as a result of benthic disturbance and turbidity. However, the impacts that would result from the proposed in-water construction activities would be similar to those resulting from maintenance dredging at the Shipyard. Within a short time after construction is complete, the benthic habitat would be expected to return to pre-construction conditions. Minor disturbances of benthic habitats from vessel propeller wakes and other vessel disturbances during operation of the berths and Dry Dock 3 would be similar to those caused by past and current use of the facility and would not represent a significant change in baseline conditions.

Threatened and Endangered Species

Atlantic Sturgeon

Spawning Atlantic sturgeon are not known within the lower Piscataqua River; however, sub-adult Atlantic sturgeon overwinter in estuarine and marine habitats and are known to use the Great Bay estuary system as year-round nursery habitat (NOAA NMFS, 1998b). Given the lack of known spawning within the Piscataqua River or Great Bay estuary, Alternative 1 would have no effect on egg, larval, and adult life stages of the Atlantic sturgeon.

Subadult Atlantic sturgeon inhabiting the lower Piscataqua River could be impacted by increased turbidity resulting from dredging and trenching as well as underwater noise at Berths 11, 12, and 13 and underwater concrete repairs at Dry Dock 3. These impacts would be the same as those described for other fish species and would be localized and short-term, ceasing upon completion of construction (see 'Fish' in Section 4.5.2.1). Sub-adults are highly mobile and capable of long-range migrations (NOAA NMFS, 1998b); therefore, individuals occurring in the Action Areas would be expected to avoid active construction areas.

As noted in previous sections, the benthic habitat and water column that would be permanently lost at Berths 11, 12, and 13 are subject to periodic disturbance from maintenance dredging and vessel operations (see 'Benthic Habitat' in Section 4.5.2.1). While Atlantic sturgeon would be permanently displaced from the bulkhead footprints, this displacement would not be expected to adversely affect the species, based on the disturbed nature of habitat in the Action Area and the species' migratory nature. In addition, the lower Piscataqua River supports a variety of estuarine habitats and aquatic life (NHFGD 2011), including sheltered habitat around neighboring islands that is less disturbed compared with the developed and industrialized areas surrounding the Shipyard. Therefore, the Navy has determined the Proposed Action may affect, but is not likely to adversely affect, the Atlantic sturgeon. The Navy is consulting with NOAA Fisheries Service under section 7 of the ESA regarding potential adverse effects on the Atlantic sturgeon as a result of the Proposed Action under Alternative 1.

Shortnose Sturgeon

Spawning and overwintering shortnose sturgeon are not known to occur within the Piscataqua River; however, shortnose sturgeon may forage in the lower Piscataqua River in the spring, and fall migrants may transit the lower river. Based on the lack of documented spawning in the Great Bay estuary or Piscataqua River, Alternative 1 would have no effect on egg, larval, and adult life stages of the shortnose sturgeon.

Sub-adult shortnose sturgeons inhabiting the lower Piscataqua River could be impacted by increased turbidity resulting from dredging and trenching as well as underwater noise at Berths 11, 12, and 13, and underwater concrete repairs at Dry Dock 3. These impacts would be the same as those described for other fish species and would be localized and short-term, ceasing upon completion of construction (see 'Fish' in Section 4.5.2.1). However, sub-adults are highly mobile (NOAA NMFS, 2010), and individuals in the Action Areas would be expected to avoid active construction areas.

Given the abundance of suitable habitat within the Great Bay estuary system, the shortnose sturgeon's migratory nature, and the short-term nature of impacts, individuals displaced by construction are not expected to be adversely impacted. The permanent loss of benthic and water column habitat is expected to be minor, given the species migratory nature, the disturbed nature of habitats adjacent to the Shipyard, and the variety of estuarine habitats and aquatic habitats within the lower Piscataqua River (see' Benthic Habitat' in Section 4.5.2.1). Therefore, the Navy has determined that the Proposed Action may affect, but is not likely to adversely affect, the shortnose sturgeon. The Navy is consulting with NOAA Fisheries Service under section 7 of the ESA regarding potential impacts on the shortnose sturgeon as a result of the Proposed Action under Alternative 1.

4.5.3 Alternative 2

The study area for the analysis of effects on marine biological resources under Alternative 2 would be the same as the study area for Alternative 1, the Preferred Alternative. However, Alternative 2 would incorporate different in-water construction techniques at Berths 11, 12, and 13 that would require a greater number of piles to be driven to support the bulkhead. In addition, under Alternative 2 more extensive repairs would be completed to the outer caisson seat at Dry Dock 3 that would require construction of a temporary, circular cellular cofferdam using steel round piles and steel sheet piles around the entrance to Dry Dock 3 to create a dry work area. The general construction method for the temporary, circular cellular cofferdam proposed under Alternative 2 is described in Appendix A. Construction of the temporary cofferdam would impact a larger 25,000 square-foot area (Action Area) around Dry Dock 3 compared with Alternative 1. The increased pile driving associated with both projects under Alternative 2 would extend the duration of elevated turbidity and underwater noise within the Action Area to a total of 275 days (Table 4.5-3).

Table 4.5-3 Pile Installation and Removal Activity for the Berths 11, 12, and 13 Structural Repairs and Dry Dock 3 Cofferdam under Alternative 2 (with Option 1)

Activity (Method)	*Pile Type*	*Piles Installed (Berth 11)*	*Piles Installed (12 & 13)*	*Piles Extracted (Berth 11)*	*Piles Extracted (12 & 13)*	*Number of Days*
Temporary Piles for Trestle System (vibratory)	14-inch steel H-type piles	64	64	-	-	32[1]
King Piles (rock-socketed)	36-inch steel H-type piles	240	195	-	-	44[2]
Sheet Piles and Returns (vibratory)	24-inch steel sheet-piles	521	472	-	-	50[3]
Permanent Sister Piles (impact)	14-inch steel H-type piles	50	37	-	-	22[1]
Timber Piles (vibratory)	15-inch timber piles	7	13	77	116	27[4]
Total Duration for Berths 11, 12, and 13 Structural Repairs						175
Activity (Method)	***Pile Type***	***Piles Installed***		***Piles Extracted***		***Number of Days***
Spud Piles for Dry Dock 3 (impact)	24-inch steel round	50		-		25[5]
Cellular Cofferdam at Dry Dock 3 (Vibratory)	20-inch steel sheet	500		500		50[3]
Spud Piles for Dry Dock 3 (vibratory)	24-inch steel round	-		50		25[5]
Total Duration for Dry Dock 3 Cofferdam						100

[1] Estimate based on assumption of one- hour transition and set up time, resulting in one pile per two hours and four piles per day (ICF Jones and Strokes and Illingworth and Rodkin, Inc. 2012).

[2] King Piles estimate based on assumption of 10 piles per day (Navy response to technical questions).

[3] Sheet Piles estimate based on assumption of 20 piles in 8 hrs (i.e., one day) installed two at a time (Navy response to technical questions).

[4] Estimate based on assumption of 30 minutes to drive each pile and 30-minute transition and set up time, resulting in 1 pile per hour and eight piles per day (ICF Jones and Strokes and Illingworth and Rodkin, Inc. 2012).

[5] Spud Piles estimate based on assumption of 2 piles in 8 hrs (i.e., one day) (Navy response to technical questions).

Like Alternative 1, the primary impacts on marine biological resources under Alternative 2 would be attributable to suspended sediments, temporary displacement, loss of habitat, and underwater noise. These impacts on marine vegetation, marine mammals, fish, and benthic invertebrates would be similar to those described under Alternative 1. Given the larger Action Area and increased pile-driving activity resulting from construction and removal of the temporary cofferdam at Dry Dock 3, impacts resulting from in-water noise and turbidity under Alternative 2 would occur over a longer duration and affect a larger area than those under Alternative 1. However, due to the topographical constraints of the area, sound propagation would be limited. The total area exposed to noise levels exceeding the NOAA Fisheries Service thresholds for Level B harassment (behavioral) take would only increase slightly, to

0.48 mi^2 (304.9 acres). Further, most of the additional pile driving under Alternative 2 would use a vibratory hammer rather than an impact hammer. The Navy would employ similar mitigation to that described under Alterative 1. Consequently, the number of marine mammal takes under Alternative 2 would remain small, and impacts to marine mammals would remain short term and minor.

The pulsed sound from impact hammering spud piles at Dry Dock 3, while short in duration, would propagate significantly further than underwater noise generated under Alternative 1. Attenuation to injury threshold would be expected to occur at 1,060 feet for the smallest class of fish. Behavioral impacts to fish would occur up to 28,140 feet (5.3 miles) from the point of impact hammering. Therefore, while impacts would be temporary, fish would experience behavioral changes over a much greater area surrounding the Action Areas under Alternative 2 compared with Alternative 1. As noted under Alternative 1, these attenuation distances are based on open-water conditions, and topographic features in and along the Piscataqua River would prevent some of the sound propagation. Therefore, these distances are conservative.

If Alternative 2 is implemented, the Navy would consult separately with the USFWS and NOAA Fisheries Service regarding potential impacts on threatened and endangered species, EFH, and marine mammals from the different in-water construction methods proposed at Berths 11, 12, and 13 and Dry Dock 3.

4.6 Visual Resources

The evaluation of visual resources in the context of environmental analysis typically addresses the contrast between visible landscape elements. Collectively, these elements comprise the aesthetic environment, or landscape character. The existing landscape character described in Section 3.7 is compared with the Proposed Action's visual qualities to determine the compatibility or contrast resulting from the Proposed Action.

As noted in Section 3.7, the affected environment, or study area, for visual resources consists of the Project sites and adjacent lands with views of the Project sites. These include the Shipyard itself, along the fitting-out pier and the flatiron pier, and the surrounding communities of the Town of Kittery and the City of Portsmouth.

Visual Resources Potential Impacts:

- No Action Alternative: No change to existing visual resources.
- Alternative 1: Minor to moderate short-term visual impacts during construction and overall minor long-term visual impacts. Short-term impacts would cease once construction is complete. No significant impacts to visual resources.
- Alternative 2: Impacts under Alternative 2 would be the same as those under Alternative 1.

4.6.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and there would be no change in existing visual resources. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.6.2 Alternative 1 (Preferred Alternative)

In-water construction areas and the presence of construction equipment would result in short-term impacts on visual resources in the study area. Minor long-term impacts would be anticipated, as the improvements associated with the in-water projects would largely be visible only at the waterline from

surrounding scenic and visually sensitive areas on the Shipyard and in waterfront areas of Kittery and Portsmouth.

4.6.2.1 Potential Impacts

Potential impacts on scenic resources on Portsmouth Naval Shipyard would be largely minimal due to its industrial character and current operations as a functioning industrial shipyard. The appearance of the Shipyard has changed over time due to the construction, modification, and demolition of various buildings and structures, including those on the fitting-out pier.

The proposed in-water projects under Alternative 1, with or without Option 1, would cause limited changes in the appearance of the Shipyard, particularly above the water line. The most noticeable visual changes would be temporary and occur during construction, when large pieces of construction equipment, such as pile drivers, cranes, and trucks, and construction materials would be at the sites and when barges may be operating in the waters off the Shipyard. Visual impacts during construction would be temporary and would cease once construction is complete. Construction for the in-water work is expected to last a total of approximately four years, occurring in phases between January 2017 and June 2019 and between October 2020 and October 2022.

The Proposed Action would result in short- and long-term changes in the appearance of the Project area in views from locations outside the Shipyard. The Proposed Action would have greater impacts on visual resources in the short term, during the construction period. The intensity of these impacts would vary depending upon the location of the viewer and the distance from the Project area. Long-term visual impacts in views from locations outside the Shipyard would be anticipated to be minimal, and the degree of visual contrast between the improvements in the Project area would diminish as the distance between the Project area and the viewer increases.

Potential impacts on views from the following visually sensitive and scenic areas have been evaluated.

- **The Back Channel of the Piscataqua River and the Town of Kittery Shoreline Scenic Area** are located less than 0.25 mile to the northwest of the Shipyard. The Back Channel of the Piscataqua River (located between the Shipyard and the Town of Kittery) and the Town of Kittery Shoreline Scenic Area (which includes the entire shoreline of Kittery, including the Shipyard) would have views of the construction activities related to the in-water work at Dry Dock 3, Berth 12, and Berth 13, especially from the Back Channel, where recreational fishers may be present for extended periods of time. Short-term, moderate impacts are expected to occur during construction.
- **The Piscataqua River** main channel is located between the Shipyard and the City of Portsmouth. Views from the main channel to the west, south, and southeast of the Shipyard would include the fitting-out pier. Impacts would be anticipated to be minimal to moderate, depending on the viewer, the speed and purpose of travel in the river, and an individual's familiarity with the Shipyard. Each of these variables would influence how the visual changes resulting from the Proposed Action would be perceived. In general, short-term construction activities would cause more intense visual impacts. Following the construction period, the bulkheads at Berths 11, 12, and 13 and the Dry Dock 3 caisson would only be intermittently visible during low tides and times when the berths are not occupied. The new in-water facilities, once in operation, would largely blend into the overall appearance of the Shipyard.

- **The Wallingford Square Scenic Area** is less than 0.25 mile from the fitting-out pier. In general, construction activities associated with the projects would be the most noticeable, but once in operation, the waterfront improvements would largely blend into the visual setting of surrounding areas of the Shipyard.. Minimal short- and long-term impacts would be anticipated to occur.
- **Badger's Island** is located less than 0.25 miles west of the Shipyard. Construction associated with the projects would be visible from properties on the eastern shoreline of the island. Visual impacts would be anticipated to be minimal to moderate, dependent on the viewer, the location in which one is viewing the Shipyard, and an individual's familiarity with the Shipyard. Each of these variables would influence how the changes would be perceived. In general, construction activities associated with the projects would be the most noticeable, but once in operation, the improvements would largely blend into the visual setting of surrounding areas of the Shipyard.
- **Government Street** and **The Kittery Foreside District** are located less than 0.25 miles north of the Shipyard. Views of the Shipyard from Government Street and inland areas of the Kittery Foreside District would be limited due to existing development and vegetation along Kittery's shoreline, while views from the shoreline in the Kittery Foreside District would be more prominent. Given the limited views of the Project area from Government Street and the inland areas of the Kittery Foreside District, the Proposed Action is not expected to result in noticeable visual impacts at these locations. Short- and long-term impacts on views from the shoreline at the Kittery Foreside District would be the same as those impacts described for the Kittery Shoreline Scenic Area above.
- **Prescott Park, Four Tree Island Park, and Peirce Island Park** are located between 0.2 and 0.4 miles south-southwest of the Shipyard. Short- and long-term visual impacts at these locations would be expected to be minimal to moderate, depending on the viewer and the individual's familiarity with the Shipyard. In general, construction activities would be the most noticeable visual aspects of the Proposed Action while, once in operation, the improvements would largely blend into the overall visual setting of the Shipyard. These impacts would also apply to **the Coastal Byway**, which varies in distance from the Shipyard depending on the route, and the **Portsmouth Historic District (including the Strawbery Banke Historic District),** which is located within 0.5 miles of the Shipyard to the southwest.

Based on the above, Alternative 1 would result in minor to moderate short-term visual impacts during construction and overall minor long-term visual impacts. Short-term impacts would cease once construction is complete. Alternative 1 would not result in significant impacts on visual resources.

4.6.3 Alternative 2

As noted under Alternative 1, in-water construction areas and the presence of construction equipment would result in short-term impacts on visual resources in the study area. Only minor long-term impacts would be anticipated, as the improvements associated with the in-water projects would largely be visible only at the waterline.

4.6.3.1 Potential Impacts

Alternative 2 would result in the same visual impacts as those described above for Alternative 1, the Preferred Alternative. Therefore, Alternative 2 would not result in significant impacts on visual resources.

4.7 Noise

Analysis of potential noise impacts includes estimating likely noise levels from the Proposed Action and determining potential effects on sensitive receptor sites.

To assess the potential severity of temporary noise levels during construction, cumulative noise exposure criteria published by the Federal Transportation Agency (FTA) has been considered. Based on general community reactions to noise at varying levels, the FTA has published a cumulative noise level curve (Figure 4.9-1) that shows that for ambient noise levels such as those existing in suburban areas near the Shipyard, a noise exposure increase of more than approximately 8 A-weighted decibels (dBA) would result in a severe impact. Based on this methodology, in areas where the existing noise exposure is below or at 55 dBA, a noise exposure increase of less than approximately 8 dBA would be noticeable but would be considered moderate to minor (FTA, 2006).

Noise Potential Impacts:

- No Action: No change in existing ambient noise levels. Continued noise from Shipyard operations.
- Alternative 1: Temporary increase in ambient noise levels during daytime hours, and minor to moderate impacts at nearest sensitive receptors.
- Alternative 2: Temporary increase in ambient noise levels during daytime hours, and moderate impacts at nearest sensitive receptors. Increases in ambient noise levels during construction would be greater than under Alternative 1.

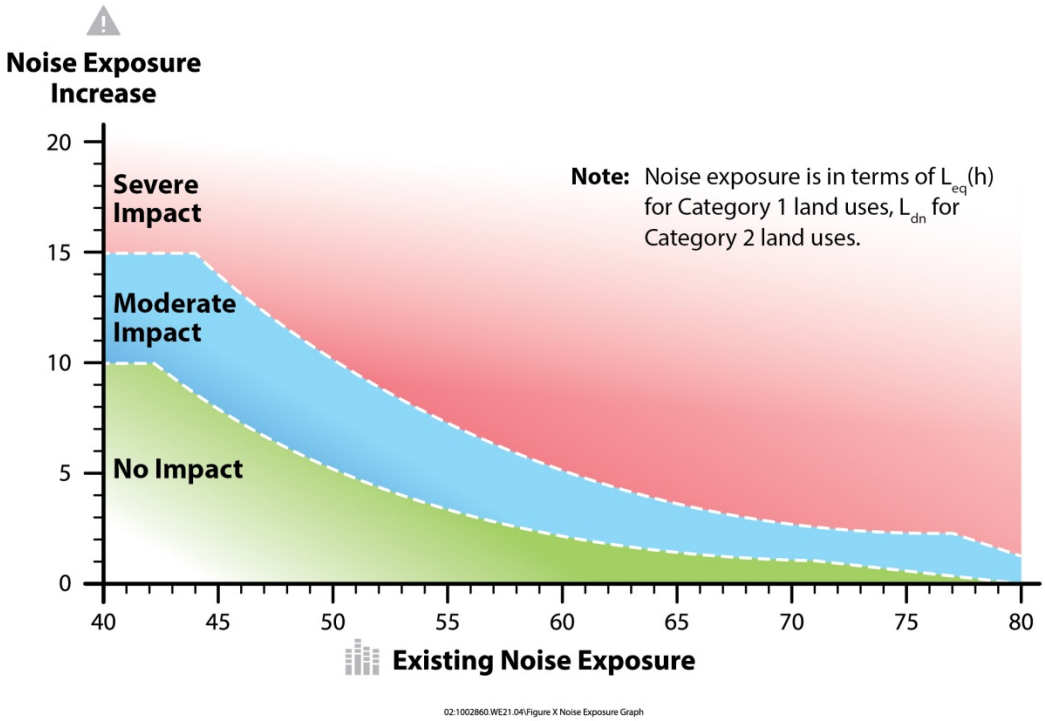

Figure 4.9-1 Increase in Cumulative Noise Levels Allowed by Criteria (dBA)

4.7.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and there would be no change to baseline noise levels. Therefore, no significant impacts on the existing noise environment would occur with implementation of the No Action Alternative.

4.7.2 Alternative 1 (Preferred Alternative)

The study area for noise for Alternative 1 includes areas and receptors within a 0.5-mile radius of the Project sites. Noise-sensitive receptors nearest to each site are identified in Table 3.7-2. The operation of heavy equipment, including pile drivers, and trucks during construction at all of the project sites would result in short-term noise impacts. This EA evaluates noise metrics relevant to a discussion of noise produced during temporary, intermittent construction operations, as described below.

4.7.2.1 Potential Impacts

Construction of the proposed projects under Alternative 1 would generate temporary noise due to the use of heavy construction equipment and heavy-duty vehicles. In particular, temporary noise during construction would be influenced by the use of vibratory hammers and pile drivers, which have the loudest noise levels associated with general construction equipment. Table 4.7-1 presents the estimated hourly sound equivalent levels (L_{eq}) produced by typical construction equipment that would be used during the proposed projects and how these levels would be perceived at various distances. The hourly L_{eq} describes the cumulative noise exposure that a receptor would perceive from construction equipment over a one-hour period. Combined noise levels from the Project construction equipment operating during an average daytime hour would be expected to be about 96 dBA at a distance of 50 feet. In addition, the Project would generate traffic to and from construction sites, primarily from heavy- and medium-duty trucks used for material and equipment hauling. Generally, noise from trucks has been reported as 84 dBA at 50 feet (FHWA, 2006).

Table 4.7-2 compares the estimated hourly L_{eq} with two additional noise metrics described in Chapter 3: SEL and the day-night average sound level (DNL). As described in Section 3.9, the SEL describes a receptor's cumulative noise exposure from a single noise event, such as a vehicle passing by or the use of loud equipment over a specific period of time. Generally, people react to the duration of noise events, judging longer events to be more annoying than shorter ones (FTA, 2006). DNL describes a receiver's cumulative noise exposure from all construction noise events over a full 24-hour period, accounting for nighttime sensitivity. DNL is generally used as the measure of cumulative noise impact for residential land uses. Table 4.7-3 shows the predicted DNL at the nearest sensitive receptors identified in Table 3.7-2.

Table 4.7-1 Alternative 1 (Preferred Alternative) Construction Hourly Sound Equivalent Level at Various Distances

Equipment Type	*Number of Units*	*Usage Factor (%)*	*$L_{eq(h)}$ at 50 feet (dBA)*	*$L_{eq(h)}$ (dBA) by Distance (feet)*					
				100	*250*	*500*	*1,000*	*1,500*	*2,000*
Cranes	6	16	85	79	71	65	59	55	53
Drill rig	1	20	78	72	64	58	52	48	46
Compressor (air)	2	40	79	73	65	34	54	49	47
Concrete pump	1	50	78	72	64	58	52	48	46
Diesel hammer	1	20	83	77	69	63	57	53	51
Dozer	1	40	81	75	67	61	55	51	49
Front-end loader	2	40	79	73	65	59	53	49	47
Gas engine vibrator	1	50	82	76	68	62	56	52	50
Gas welding machine	1	40	70	64	56	50	44	40	38
Grader	1	40	81	75	67	61	55	51	49
Hydraulic excavator	1	40	81	75	67	61	55	51	49
Vibratory hammer	1	20	83	77	69	63	57	53	51
Vibratory roller	1	20	78	72	64	58	52	48	46
Vibratory pile driver	1	20	94	88	80	74	68	64	62
Total			96	90	82	76	70	67	64

Source: Federal Highway Administration 2006.

Key:
dBA = decibel (A-weighted average)
$L_{eq(h)}$ = Hourly Sound Equivalent Level

Table 4.7-2 Alternative 1 (Preferred Alternative) Construction Noise Summary

Project Construction Noise Descriptors	*Estimated Sound Levels (dBA) by Distance (feet)*						
	50	*100*	*250*	*500*	*1,000*	*1,500*	*2,000*
Sound Exposure Level (SEL)	136	130	122	116	110	106	104
Hourly Equivalent Sound Level (L_{eq})	96	90	82	76	70	67	64
Day-Night Average Sound Level (DNL)	82	76	68	62	56	53	50

Key:
dBA = decibel (A-weighted average)
SEL = sound exposure level. It describes a receptor's cumulative noise exposure from a single noise event. Louder events have greater SELs than do quieter ones. In addition, events that last longer in time have greater SELs than do shorter ones.
L_{eq} = equivalent sound level. It describes a receptor's cumulative noise exposure from all events over a 1-hour period of time
DNL = day-night average sound level. It describes a receptor's cumulative noise exposure from all events over a 24-hour period, with a 10-dB penalty assigned to noise events occurring between 10 p.m. and 7 a.m. Since the project would only occur during daytime hours, DNL only accounts for daytime construction noise.

Table 4.7-3 Alternative 1 (Preferred Alternative) Cumulative Construction Noise Exposure at Nearest Sensitive Receptors

Project Location	*Nearest Sensitive Noise Receptor and Relative Location*	*Distance to Receptor (feet)*	*DNL at Receptor (dBA)*	*Project Noise Exposure Increase (dBA)*[1]	*Expected Noise Impact*[2]
Dry Dock 3[3]	Residence north of Dry Dock 3 on Knight Ave, Kittery	690	54	N/A	No Impact
	School northeast of Dry Dock 3, on Williams Ave, Kittery	1,600	47	N/A	No Impact
Berths 11A, 11B, and 11C	Residence building southwest of Berths 11A, 11B, and 11C adjacent to Prescott Park, Portsmouth	1,730	52	N/A	No Impact
Berth 12	Residence northwest of Berth 12, on Island Ave, Badgers Island	740	59	4	Moderate
Berth 13A	Residence northwest of Berth 13A, on Old Armory Way, Kittery	950	57	2	No Impact
Berth 13B	Residence west of Berth 13B, on Island Avenue, Badgers Island	700	59	4	Moderate

Source: Google Earth, 2015; FTA, 2006.

Notes:
(1) It has been assumed that the existing ambient noise level at receptors during daytime hours is equivalent to the Town of Kittery's daytime noise standard of 55 dBA.
(2) Based on the Federal Transportation Administration's noise impact criteria for increase in cumulative noise levels. For an existing noise exposure of 55 dBA, the FTA's allowable DNL noise exposure increase in residential areas is 3 dBA. An increase between 3 and 8 dBA would be a moderate impact, while any increase above 8 dBA would be a severe impact (FTA, 2006).
(3) Estimates for the Dry Dock 3 caisson replacement exclude the use of vibratory hammers and hydraulic excavators.

Key:
dBA = decibel (A-weighted average)
N/A = not applicable

Construction of the bulkheads at Berths 11, 12, and 13 would require the use of drilling and pile-driving equipment. This type of equipment along with multiple cranes and compressors would be the dominant sources of noise during construction. Additionally, the proposed projects would require multiple heavy-duty truck trips for material and equipment hauling. As shown in Table 4.7-1, approximately 14 peak daily truck trips would be required for Phase 1 and 10 daily trips for Phase 2. In total, approximately 2,150 truck trips would take place in the course of the Project, or approximately 2,600 total truck trips if Option 1 were selected. The use of heavy-duty equipment and transit of additional vehicles through Gates 1 and 2 would be temporary and intermittent during the proposed construction periods. All construction and material/equipment-hauling activities would occur during daytime hours.

Noise levels decrease by about 6 dBA for each doubling of the distance between the fixed noise source and the receptor. As shown in Table 4.7-3, several sensitive residential receptors have been identified between approximately 690 feet and 1,730 feet from the project sites. Additionally, Table 3.7-2 identifies residential receptors adjacent to Gates 1 and 2 that would be temporarily exposed to an increase in traffic noise. Sensitive receptors identified in Tables 3.7-2 and 4.7-3 are located in the Town of Kittery, Maine, and the City of Portsmouth, New Hampshire. Construction would be audible (i.e., result in increases in noise levels greater than 3 dBA above ambient noise levels) during daytime hours at the majority of these receptors. However, given the temporary and intermittent nature of the proposed construction work, the short-term impact on nearby residential receptors would be considered minor to moderate.

The Town of Kittery Municipal Code, Title 16, Section 16.9.1.9(E) exempts noise created from construction and maintenance activities from the municipal sound pressure level regulations, as long as such activities occur between 7:00 a.m. and 9:00 p.m. Similarly, the City of Portsmouth Noise Control Ordinance exempts construction, demolition, or repair of buildings activities from local noise standards if those activities are performed between 7:00 a.m. and 6:00 p.m. In particular, the City of Portsmouth prohibits the operation of pile drivers and hammers between 10:00 p.m. and 7:00 a.m. Although these local ordinances do not apply to the Navy, the Navy strives to minimize impacts from construction noise on surrounding communities. As noted, construction would occur only during daylight hours and would be consistent with the requirements established by the Town of Kittery and City of Portsmouth.

Therefore, implementation of Alternative 1 would not result in significant impacts on the noise environment during construction. During Shipyard operations, it is expected that noise levels would be similar to those described in Table 3.7-3, resulting in no increase over baseline levels or long-term noise impacts.

4.7.3 Alternative 2

The study area for noise for Alternative 2 is the same as the study area described for Alternative 1, comprising areas and receptors within a 0.5-mile radius of the Project sites. The noise-sensitive receptors nearest to each of these sites are identified in Table 3.7-2. The operation of trucks and heavy equipment, including pile drivers, during construction at both Project sites would result in short-term noise impacts. Alternative 2 would require additional pile driving at Berths 11, 12, and 13; pile driving at Dry Dock 3, and an increase in peak daily vehicle trips (as shown in Table 4.7-1), would result in greater short-term noise impacts compared with Alternative 1.

4.7.3.1 Potential Impacts

Alternative 2 would require the same general construction methods and types of equipment described for Alternative 1. However, as shown in Table 2-4, Alternative 2 would require additional pile driving at Berths 11, 12, and 13 because of the use of steel sheet-piles to construct the bulkheads and the increase in the number of king piles, and pile driving and extraction to construct and remove the temporary cofferdam at Dry Dock 3. The increase in number of piles that would be installed during the same period of construction would require additional impact-driving and drilling equipment, resulting in higher hourly L_{eq}, SEL, and DNL levels than those estimated for Alternative 1, as shown in Tables 4.7-4 and 4.7-5 below.

Table 4.7-4 Alternative 2 Construction Noise Summary

Project Construction Noise[1]	*Estimated levels (dBA) by Distance (feet)*						
	50	*100*	*250*	*500*	*1,000*	*1,500*	*2,000*
Sound Exposure Level (SEL)	138	132	124	118	112	109	106
Hourly Equivalent Sound Level (L_{eq})	99	93	85	79	73	69	67
Day-Night Average Sound Level (DNL)	85	79	71	65	59	55	53

Notes:
(1) Project construction noise estimates for Alternative 2 are conservative and assume the use of a total of four vibratory hammers and two pile drivers operating at a single day.

Key:
dBA = decibel (A-weighted average)
SEL = sound exposure level. It describes a receptor's cumulative noise exposure from a single noise event. Louder events have greater SELs than do quieter ones. In addition, events that last longer in time have greater SELs than do shorter ones.
L_{eq} = equivalent sound level. It describes a receptor's cumulative noise exposure from all events over a one-hour period of time
DNL = day-night average sound level. It describes a receptor's cumulative noise exposure from all events over a 24-hour period, with a 10-dB penalty assigned to noise events occurring between 10:00 p.m. and 7:00 a.m. Since the project would only occur during daytime hours, DNL only accounts for daytime construction noise.

Although construction activities would be temporary and intermittent, as shown in Table 4.7-5, simultaneous operation of loud equipment would likely exceed existing DNL by more than 3 dBA at the nearest residential receptors to Dry Dock 3 and Berths 12 and 13, resulting in a short-term, moderate impact during construction. Based on the Federal Transportation Administration's noise impact criteria for increase in cumulative noise levels in residential areas, an increase between 3 and 8 dBA would be a moderate impact in residential areas with ambient noise levels of 55 dBA, while any increase above 8 dBA would be a severe impact (FTA, 2006). In the event the operation of additional impact-driving and drilling equipment results in an increase over 8 dBA, impacts on the nearest sensitive receptors would be significant.

Table 4.7-5 Alternative 2 Construction Noise Exposure at Nearest Sensitive Receptors

Project Location	*Nearest Sensitive Receptor and Relative Location*	*Distance to Receptor (feet)*	*DNL at Receptor (dBA)*[1]	*Project Noise Exposure Increase (dBA)*[2]	*Expected Noise Impact*[3]
Dry Dock 3	Residence north of Dry Dock 3 on Knight Ave, Kittery	690	62	7	Moderate
	School northeast of Dry Dock 3, on Williams Ave, Kittery	1,600	55	0	No impact
Berths 11A, 11B, and 11C	Residence building southwest of Berths 11A, 11B, and 11C adjacent to Prescott Park, Portsmouth.	1,730	54	N/A	No impact
Berth 12	Residence northwest of Berth 12, on Island Ave, Badgers Island	740	61	6	Moderate

Table 4.7-5 Alternative 2 Construction Noise Exposure at Nearest Sensitive Receptors

Project Location	*Nearest Sensitive Receptor and Relative Location*	*Distance to Receptor (feet)*	*DNL at Receptor (dBA)*[1]	*Project Noise Exposure Increase (dBA)*[2]	*Expected Noise Impact*[3]
Berth 13A	Residence northwest of Berth 13A, on Old Armory Way, Kittery	950	59	4	Moderate
Berth 13B	Residence west of Berth 13B, on Island Avenue, Badgers Island	700	62	7	Moderate

Source: Google Earth, 2015; FTA, 2006.

Notes:
(1) Project construction noise estimates for Alternative 2 are conservative and assume the use of a total of four vibratory hammers and two pile drivers operating at a single day.
(2) It has been assumed that the existing ambient noise level at receptors during daytime hours is equivalent to the Town of Kittery's daytime noise standard of 55 dBA.
(3) Based on Federal Transportation Administration's noise impact criteria for increase in cumulative noise levels. For an existing noise exposure of 55 dBA, the FTA's allowable DNL noise exposure increase in residential areas is 3 dBA. An increase between 3 and 8 dBA would be a moderate impact, while any increase above 8 dBA would be a severe impact (FTA, 2006).

Key:
dBA = decibel (A-weighted average)
N/A = not applicable
SPL = sound pressure level

Therefore, implementation of this alternative could result in short-term moderate impacts on the noise environment during construction. During Shipyard operations, it is expected that noise levels would be similar to those described in Table 3.7-3, resulting in no increase over baseline levels or long-term noise impacts.

4.8 Infrastructure

This section analyzes the magnitude of anticipated increases or decreases in public works infrastructure demands, considering historic levels, existing management practices, and storage capacity, and evaluates potential impacts on public works infrastructure associated with implementation of the alternatives for the Proposed Action. Impacts are evaluated by whether they would result in the use of a substantial proportion of the remaining system capacity, reach or exceed the current capacity of the system, or require development of facilities and sources beyond those existing or currently planned.

Infrastructure Potential Impacts:

- No Action Alternative: No changes to existing infrastructure at the Shipyard.
- Alternative 1: Short-term, minor impacts as a result of the need to dispose of construction and demolition debris. Negligible impacts on stormwater management and energy use.
- Alternative 2: Short- and long-term impacts would be similar to those under Alternative 1.

4.8.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and there would be no change to the existing infrastructure of the Shipyard. Therefore, no significant impacts on infrastructure would occur with implementation of the No Action Alternative.

4.8.2 Alternative 1 (Preferred Alternative)

The study area for potential impacts on infrastructure is Portsmouth Naval Shipyard. Alternative 1 would not result in increases in demand for utilities that would affect or require upgrade of utility infrastructure in the surrounding community. Therefore, Alternative 1 would not result in impacts on utility infrastructure off the Shipyard.

Work on the pier surface at Berths 11, 12, and 13 during construction may affect underground utility infrastructure. Construction would result in solid waste that would need to be collected at each project site for disposal, and ground-disturbance during construction may affect stormwater management at the Shipyard.

4.8.2.1 Potential Impacts

Stormwater

The Berths 11, 12, and 13 structural repairs would require extending existing storm drain outfalls located along these berths through the proposed fill and concrete shutter panels to discharge on the water side of the proposed bulkheads. Storm drains along the berths, which collect and discharge stormwater from inland facilities and paved areas of the CIA, would be relocated and repaired as necessary to address existing deterioration of the drains or prevent future maintenance issues. New pipes installed at the ends of the drains would be increased to the next-largest size of pipe to allow for future changes to stormwater infrastructure. Drainage openings in the concrete pier deck that discharge stormwater runoff from the pier directly to the river would remain in place (MN-FST 2015a).

Following construction of the bulkheads, the existing timber pier deck would be extended outward to the new berth faces, which would expand the surface of the pier deck by approximately 11,185 square feet (0.25 acre). Stormwater collected on the new deck surface would drain directly to the river. The proposed Berths 11, 12, and 13 structural repairs would not result in the conversion of pervious surface to impervious surface and would not substantially change the pre-development hydrology of the fitting-out pier because precipitation falling on the timber pier deck extension would drain directly to the river. Therefore, the proposed Berths 11, 12, and 13 structural repairs under Alternative 1 would be exempt from the requirements of Section 438 of the Energy Independence and Security Act of 2007. The proposed project also would be exempt from the Navy's Low Impact Development policy, which applies to projects that alter the pre-development hydrology of a site. Short- and long-term impacts on stormwater management resulting from this Project would be negligible.

The proposed Dry Dock 3 caisson replacement and concrete sill repairs would not affect stormwater infrastructure at the dry dock or result in any increases in impervious surface; therefore, this Project would not result in impacts on stormwater management.

Solid Waste Management

Solid waste generated under Alternative 1 would consist of construction and demolition (C&D) debris from removal of concrete and wood decking, utility infrastructure, and the timber fender system at each

berth during Phases 1 and 2, as well as miscellaneous construction debris. The construction contractor would be responsible for collecting, managing, and disposing of C&D debris and other solid waste.

The amount of solid waste generated under Alternative 1 would be minimized through salvaging or recycling materials removed from the pier and berths to the greatest extent practicable. The construction contractor would comply with Navy requirements for solid waste management, which conform to applicable federal, state, and local regulations intended to protect the environment through management of solid waste. The requirements address work practices that would be implemented to ensure that the amount of solid waste generated is minimized, solid waste is recycled to the extent practicable, and solid waste that cannot be salvaged or recycled is disposed of in an environmentally responsible manner at permitted and approved C&D debris landfills. Solid waste generated under Alternative 1 is not expected to exceed the capacities of regional recycling and landfill facilities; therefore, implementation of Alternative 1 would have a negligible short-term impact on solid waste management. Implementation of Alternative 1 would have no long-term impacts on solid waste management on the Shipyard. Following implementation of Alternative 1, the Shipyard would continue to manage solid waste under standard operating procedures.

Dredge spoils exceeding Maine Department of Environmental Protection Solid Waste Management Rules (Chapter 418) criteria for toxicity would be disposed of by the construction contractor at an authorized landfill in accordance with the requirements of the solid waste management rules and regulations (38 M.R.S.A. Section 1301) (MN-FST, 2015b). Approximately 2,970 square feet of dredge spoils, consisting of riprap dredged from the bulkhead footprint at Berth 12, would be disposed of at an approved upland landfill facility under Alternative 1, with or without implementation of Option 1. The volume of dredge spoils disposed of under this alternative could be reduced through reuse of this riprap for construction or other purposes. The volume of dredge spoils potentially requiring disposal is not expected to exceed the capacity of regional landfills; therefore, Alternative 1 would have short-term, minor impacts on solid waste management, and no long-term impacts are expected.

Energy

Construction of the proposed in-water projects may result in a minor short-term increase in the consumption of energy at the Shipyard as a result of the operation of construction equipment. However, construction projects are in progress on an ongoing, regular basis at the Shipyard, so any increase in electrical consumption would be minor and within the range of normal electricity use at the Shipyard.

Relocation or removal of electrical infrastructure would be required during the Berths 11, 12, and 13 structural repairs, particularly at Berth 11A. This infrastructure would be removed and reinstalled, replaced, or not replaced as warranted by operational requirements. For instance, conduits connected to floodlights at the piers would be removed and the lights replaced with solar-powered floodlights (MN-FST, 2015b). No work on the electrical system at Dry Dock 3 would be required as part of the Dry Dock 3 caisson replacement project (Appledore Marine Engineering, n.d.).

The Proposed Action would not result in any changes in Shipyard operations; therefore, electrical consumption at the Shipyard following completion of the berth structural repairs and Dry Dock 3 caisson replacement is not expected to change, and negligible short- or long-term impacts on Shipyard or regional electrical infrastructure would result.

Based on the above, implementation of Alternative 1 would not result in significant impacts on infrastructure.

4.8.3 Alternative 2

The study area for potential impacts on infrastructure is Portsmouth Naval Shipyard. Alternative 2 would not result in increases in demand for utilities that would affect or require upgrading of utility infrastructure in the surrounding community. Therefore, Alternative 1 would not result in impacts on utility infrastructure off the Shipyard.

Ground-disturbance at Berths 11, 12, and 13 during construction may affect buried utility infrastructure. Construction would result in solid waste that would need to be collected at each project site for disposal and may affect stormwater management at the Shipyard.

4.8.3.1 Potential Impacts

Impacts on Shipyard utilities and infrastructure under Alternative 2 would be similar to those described under Alternative 1 for each of the proposed waterfront improvement projects. The different in-water construction techniques proposed for the Berths 11, 12, and 13 structural repairs project under Alternative 2 would not result in substantially different impacts on infrastructure at these berths because the same areas would be impacted during construction. The extent of the concrete pier deck and timber fender system at Berths 11, 12, and 13 that would be demolished under Alternative 2, with and without Option 1, would be the same as the extent demolished under Alternative 1. The construction techniques proposed under Alternative 2 would not result in generation of a greater amount of solid waste or C&D debris.

Impacts on solid waste management under Alternative 2 would be similar to those described under Alternative 1. However, Alternative 2 would require more dredging than Alternative 1 since the temporary cofferdam footprint at Dry Dock 3 also would be dredged, and a larger volume of dredge spoils would be disposed of under this alternative. Approximately 33,480 square feet of dredge spoils may require disposal at an authorized landfill in accordance with the Maine Solid Waste Management rules and regulations. Therefore, Alternative 2 would result in greater, but still minor, impacts on solid waste management.

Like Alternative 1, Alternative 2 would result in short-term minor and no long-term impacts on infrastructure. Implementation of this alternative would not result in significant impacts to infrastructure.

4.9 Transportation

The transportation analysis considers the impact of the construction traffic likely to be generated over the course of the Proposed Action on the local transportation network, as well as any permanent changes in transportation patterns that may result from the Proposed Action.

Transportation Potential Impacts:

- No Action Alternative: No change in existing transportation conditions.
- Alternative 1: Temporary, minor increases in vehicle traffic during construction, no significant impact.
- Alternative 2: Average peak and daily vehicle trips during construction would be slightly higher under Alternative 2. No significant impact on transportation.

4.9.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and no changes would occur to current transportation conditions. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.9.2 Alternative 1 (Preferred Alternative)

The study area encompasses the Shipyard and the transportation network that provides access to the Shipyard, as described in Section 3.11.

Alternative 1 would require transportation of equipment and materials via trucks, and construction workers via personal vehicles, to and from the Project sites to complete the waterfront improvement projects. It is anticipated that the cranes that would be used to complete in-water work at the berths and Dry Dock 3 would be delivered to the Project sites and operated via barge.

4.9.2.1 Potential Impacts

A short-term increase in truck and privately owned vehicle (POV) traffic in the vicinity of the Shipyard would occur during construction under Alternative 1 because demolition waste, dredged sediments, and drill spoils captured during drilling would be transported to approved regional recycling facilities or landfills; construction equipment, fill material, concrete, king piles, steel sheet-piles, and other construction materials would be transported to the site; and construction workers would commute to and from the site. Table 4.9-1 shows average and peak truck and POV trips during each phase of construction. Delivering fill material to the Project site at Berths 11, 12, and 13 would account for the majority of the truck trips. In total, approximately 2,150 truck trips would take place in the course of the Project, or approximately 2,600 total truck trips if Option 1 were selected.

POV trips would account for the majority of overall vehicle trips during construction of all four waterfront improvement projects. As shown in Table 4.9-1, the estimated peak trip numbers are also used as conservative proxies for the average trips. In total, approximately 14,500 POV trips would occur during the six-year-long construction period for the Proposed Action, or 20,500 total POV trips if Option 1 were selected. The numbers of POV trips shown in Table 4.9-1 are conservative estimates. Because parking is limited on the Shipyard, some carpooling would be expected, which would reduce the number of trips. In addition, the number of personnel required at the Project sites would vary depending on the phase of construction; therefore, the actual average POV and total vehicle trips are expected to be less than the averages shown in the table.

Table 4.9-1 Average Daily Truck Trips and Privately Owned Vehicle (POV) Trips for the Proposed Waterfront Improvement Projects, Alternatives 1 (Preferred Alternative) and 2

Construction Phase	*Average Daily Truck Trips*	*Peak Daily Truck Trips*	*Average Daily POV Trips*	*Peak Daily POV Trips*	*Average Daily Trips (Truck + POV)*	*Peak Daily Trips (Truck + POV)*
Alternative 1, Phase 1	2	14	34	34	36	48
Alternative 1, Phase 1, Option 1	Less than 1	14	58	58	59	72
Alternative 1, Phase 2	3	10	24	24	27	34
Alternative 2, Phase 1	2	14	43	43	45	57
Alternative 2, Phase 1, Option 1	Less than 1	14	68	68	69	82
Alternative 2, Phase 2	3	10	24	24	27	34

Because construction work on Berth 11 would overlap in time with work on the Dry Dock 3 caisson replacement, there could be up to 59 total truck and POV trips on average and 72 truck and POV trips on peak work days if Option 1 is selected. The peak number of truck trips would be anticipated to occur during the Project stages requiring loads of fill to be delivered to Berths 11, 12, and 13.

Table 4.9-2 shows this overall peak daily construction traffic as a percentage of the measured average annual daily traffic (AADT) of local roads and highways around the Shipyard. As shown in Table 4.9-2, 72 daily trips, the highest estimated peak daily number of trips, would be at or below 1 percent of the AADT for most of the listed roads and 3 percent or less of the AADT for all of the listed roads.

This level of traffic would not be expected to result in significant impacts on transportation on local roads.

In terms of traffic entering and exiting the Shipyard, construction traffic would not be expected to have a significant impact on overall Shipyard traffic congestion during the course of the Project. The recent repairs to Bridge 1 would allow construction traffic (and all traffic) to flow over both Bridge 1 and Bridge 2. Construction traffic for the Proposed Action represents only a small fraction of total daily trips in and out of the Shipyard, and the Shipyard is accustomed to accommodating multiple construction projects at any given time.

Therefore, construction under Alternative 1 would result in short-term, minor impacts on transportation. There would be no long-term or significant impacts on the local transportation network or Shipyard traffic under Alternative 1.

Table 4.9-2 Overall Peak Construction Traffic as a Percentage of Existing Average Annual Daily Traffic (AADT), Alternative 1 (Preferred Alternative)

Road	*Section*	*AADT (Year)*	*Overall Peak Construction Traffic (% of AADT)*
Interstate 95	Northbound at the New Hampshire state line	36,320 (2014)	<1%
	Southbound at the New Hampshire state line	37,500 (2014)	<1%
U.S. Route 1	At the New Hampshire state line (Memorial Bridge) (Northbound and Southbound)	8,650 (2010)	1%
	Northbound north of State Route (S.R.) 103 (Walker Street)	4,110 (2013)	2%
	Southbound south of S.R. 103 (Walker Street)	4,420 (2010)	2%
U.S. Route 1 Bypass	At the New Hampshire state line (Sarah Mildred Long Bridge) (Northbound and Southbound)	15,670 (2011)	<1%
	Northbound southwest of U.S. Route 1	4,110 (2010)	2%
	Southbound southwest of U.S. Route 1	2,640 (2010)	3%
S.R. 236 (Shapleigh Road)	Southeast of Rogers Road (Northbound and Southbound)	12,070 (2013)	1%
S.R. 103 (Walker Street)	East of U.S. Route 1 (Eastbound and Westbound)	8,460 (2013)	1%

Source: Maine Department of Transportation, August 26, 2015

1 Where both directions are indicated, AADT indicates total number of vehicles traveling in both directions.

4.9.3 Alternative 2

Alternative 2 would also require transportation of equipment and materials via trucks, and construction workers via personal vehicles, to and from the Project sites to complete the waterfront improvement

projects. As in Alternative 1, it is anticipated that the cranes that would be used to complete in-water work at the berths and Dry Dock 3 would be delivered to the Project sites and operated via barge.

4.9.3.1 Potential Impacts

As under Alternative 1, a short-term increase in truck and POV traffic in the vicinity of the Shipyard would occur during construction under Alternative 2 because demolition waste and drill and dredge spoils would be transported to approved regional recycling facilities or landfills; equipment and materials would be transported to and from the site; and construction workers would commute to and from the site. The average and peak daily truck trips, POV trips, and total trips under Alternative 2 were calculated the same way as under Alternative 1. As shown in Table 4.9-1, the differences in construction materials and equipment needed for Alternative 2 result in a slightly higher number of average and peak daily POV trips relative to Alternative 1. However, as shown in Table 4.9-3, the overall peak daily construction traffic of 82 trips under Alternative 2, expressed as a percentage of the measured AADT of local roads and highways around the Shipyard, would be the same as under Alternative 1. Therefore, as under Alternative 1, construction of Alternative 2 would result in short-term, minor impacts on transportation, and there would be no long -term or significant impacts on the local transportation network.

Table 4.9-3 Overall Peak Construction Traffic as a Percentage of Existing Average Annual Daily Traffic (AADT), Alternative 2

Road	*Section1*	*AADT (Year)*	*Overall Peak Construction Traffic (% of AADT)*
Interstate 95	Northbound at the New Hampshire state line	36,320 (2014)	<1%
	Southbound at the New Hampshire state line	37,500 (2014)	<1%
U.S. Route 1	At the New Hampshire state line (Memorial Bridge) (Northbound and Southbound)	8,650 (2010)	1%
	Northbound north of State Route (S.R.) 103 (Walker Street)	4,110 (2013)	2%
	Southbound south of S.R. 103 (Walker Street)	4,420 (2010)	2%
U.S. Route 1 Bypass	At the New Hampshire state line (Sarah Mildred Long Bridge) (Northbound and Southbound)	15,670 (2011)	1%
	Northbound southwest of U.S. Route 1	4,110 (2010)	2%
	Southbound southwest of U.S. Route 1	2,640 (2010)	3%
S.R. 236 (Shapleigh Road)	Southeast of Rogers Road (Northbound and Southbound)	12,070 (2013)	1%
S.R. 103 (Walker Street)	East of U.S. Route 1 (Eastbound and Westbound)	8,460 (2013)	1%

Source: Maine Department of Transportation, 2015

1 Where both directions are indicated, AADT indicates total number of vehicles traveling in both directions.

4.10 Hazardous Materials and Wastes

The hazardous materials and wastes analysis addresses issues related to the use and management of such materials and wastes.

Hazardous Materials and Wastes Potential Impacts:

- No Action: No change associated with hazardous materials and wastes.
- Alternative 1: Negligible impacts from handling of hazardous materials, generation and management of hazardous waste, and handling of materials with special hazards.
- Alternative 2: Impacts would be the same as under Alternative 1.

4.10.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with hazardous materials and wastes. Routine Shipyard activities would continue to involve the use of hazardous materials, the generation of hazardous waste, and the proper handling of special hazards (asbestos-containing materiel [ACM], lead-based paint [LBP], and polychlorinated biphenyls [PCBs]). No significant impacts would occur with implementation of the No Action Alternative.

4.10.2 Alternative 1 (Preferred Alternative)

The study area for defining potential impacts on the environment from hazardous materials and wastes encountered during or generated by Alternative 1 is the immediate Project area. Construction activities for the proposed waterfront improvement projects may involve the use of hazardous materials, generation of hazardous waste, or handling of materials with special hazards.

4.10.2.1 Potential Impacts

Hazardous Materials

Hazardous materials used to install the bulkheads and piles and replace the Dry Dock 3 caisson would be used in accordance with the Navy's Hazardous Material Control and Management Program. Following that program would ensure that only the hazardous materials essential to performing the work are used. Such hazardous materials would consist of construction adhesives, solvents, chemicals, sealants, paints, and welding gases, as well as oil and fuel to operate vehicles and equipment.

Work near the above-ground storage tanks that currently exist in the Project area would be performed in accordance with the Shipyard's SPCC Plan to prevent the discharge of oil into the waters of the Piscataqua River. Similarly, work around any underground storage tanks in the Project area would be conducted in accordance with Resource Conservation and Recovery Act (RCRA) regulations (40 CFR parts 280 to 282) and state regulations to prevent and respond to any spills or releases.

Compliance with federal and state regulations and Navy procedures for working with hazardous materials would result in negligible impacts. Therefore, implementation of Alternative 1 would not result in significant impacts from the handling or presence of hazardous materials.

Hazardous Waste

Some RCRA hazardous wastes would be generated during installation of the bulkheads and piles and replacement of the Dry Dock 3 caisson under Alternative 1. Operation of heavy equipment and machinery and other demolition and construction tasks would result in the generation of hazardous wastes such as oils, chemicals, solvents, and paints, and universal wastes such as batteries. Construction

personnel would be required to manage hazardous waste in accordance with federal and state requirements and with Shipyard Instruction 5090.30A, Hazardous Waste Generator Standards.

As discussed in Section 3.10.2.2, soil in areas adjacent to Berths 11, 12, and 13 contains petroleum hydrocarbons and arsenic at concentrations exceeding Maine remedial action guideline standards. Sediment in certain areas near Berth 11 contains lead and arsenic at levels sufficiently above MEDEP Solid Waste Management Rules for Beneficial Use of Solid Wastes (Chapter 418) that the sediment would not be able to be reused at the site and would require specialized disposal (MN-FST, 2015b). Other waste soil, sediment, and materials generated under Alternative 1 that similarly contain elevated levels of hazardous constituents above state standards would be subject to management under the same rules, as well as applicable federal and state hazardous waste management regulations. Any mercury-containing light bulbs that are removed from fluorescent light fixtures at Dry Dock 3 during replacement of the caisson would be managed and properly disposed of as a hazardous waste.

Negligible impacts would result because only small quantities of hazardous waste would be generated, and the Navy and contractors would comply with a framework of federal and state regulations and Navy procedures for the management of hazardous waste. Therefore, implementation of Alternative 1 would not result in significant impacts from the generation and management of hazardous waste.

Special Hazards (Asbestos-containing Material, Lead-based Paint, Polychlorinated Biphenyls)

Based on the age of the Shipyard, it can be assumed that ACM and LBP could be present in older structural components in the Project area. LBP has been reported to be present on Berths 11, 12, and 13 and on certain exterior surfaces of the Dry Dock 3 caisson. ACM and LBP would be removed, managed, and properly disposed of in accordance with federal and state requirements that ensure that human health and the environment are protected. Those requirements address ACM and LBP removal and disposal, worker safety, and air quality. ACM also would be managed in accordance with Shipyard Instruction 5100.92, Asbestos Operations & Maintenance Program Manual.

As discussed in Section 3.10.2.3, sediment in certain areas near Berth 13 contains PCBs at levels above MEDEP Solid Waste Management Rules for Beneficial Use of Solid Wastes (Chapter 418) but at levels sufficiently low that the sediment could be reused at the site (MN-FST, 2015b). Other waste soil, sediment, and materials generated under Alternative 1 that contain elevated levels of PCBs would be managed in accordance with federal and state requirements and with Shipyard Instruction 5090.30A, Hazardous Waste Generator Standards, which addresses the handling of waste PCBs.

Negligible impacts would result because only small quantities of wastes containing special hazards would be generated, and the Navy and contractors would comply with a framework of federal and state regulations and Navy procedures for the management of special hazards. Therefore, implementation of Alternative 1 would not result in significant impacts from the management of special hazards.

4.10.3 Alternative 2

The study area for defining potential impacts on the environment from hazardous materials and wastes encountered during or generated by Alternative 2 is the immediate Project area. Like Alternative 1, construction activities under Alternative 2 may involve the use of hazardous materials, generation of hazardous waste, or handling of materials with special hazards.

4.10.3.1 Potential Impacts

The potential impacts on the environment from the use of hazardous materials, generation and management of hazardous waste, and handling of materials with special hazards would be the same for Alternative 2 as described for Alternative 1.

4.11 Summary of Potential Impacts on Resources and Impact Avoidance and Impact Avoidance and Minimization

A summary of the potential impacts associated with each of the action alternatives and the No Action Alternative and impact avoidance and minimization measures are presented in Tables 4.11-1 and 4.11-2, respectively. Table 4.11-2 provides a comprehensive list of all mitigation requirements associated with the Proposed Action.

Table 4.11-1 Summary of Potential Impacts on Resource Areas

Resource Area	*No Action Alternative*	*Alternative 1 (Preferred Alternative)*	*Alternative 2*
Air Quality	No change in emissions. No change in the vulnerability of Shipyard waterfront infrastructure to the impacts of climate change.	Annual direct emissions of criteria pollutants during construction and after implementation would not result in significant impacts on air quality. Routine operational activities would generate a minimal annual increase in GHG emissions that would not be likely to contribute to global warming to a discernible extent. Reduced vulnerability of Shipyard waterfront infrastructure to the impacts of climate change.	Annual direct emissions of criteria pollutants during construction and after implementation would not result in significant impacts on air quality. Routine operational activities would generate a minimal annual increase in GHG emissions that would not be likely to contribute to global warming to a discernible extent. Reduced vulnerability of Shipyard waterfront infrastructure to the impacts of climate change.
Water Resources	No change in water resources.	Short-term minor impacts on surface water, wetlands, and marine sediments resulting from disturbance and potential water quality impacts during construction. No impact on the floodplain. Short-term impacts would be minimized through use of standard BMPs and compliance with applicable federal and state permits and regulations. Long-term, minor impacts on wetlands due to permanent fill of 98,800 square feet to 118,800 square feet (with Option 1) of the Piscataqua River. Compensatory mitigation for the loss of coastal habitat functions and values as a result of the proposed fill will occur in the form of an in-lieu fee paid to the Maine DEP prior to the start of construction.	Greater short-term impacts during construction as a result of additional pile driving and the construction of a temporary cofferdam under this alternative. No impact on the floodplain. Short-term impacts would be minimized through use of standard BMPs and compliance with applicable permits and regulations and would be minor. Temporary and permanent fill would impact an area of 106,258 square feet to 126,258 square feet (with Option 1) of the Piscataqua River. Compensatory mitigation for the loss of coastal habitat functions and values as a result of the proposed fill will occur in the form of an in-lieu fee paid to the Maine DEP prior to the start of construction.

Table 4.11-1 Summary of Potential Impacts on Resource Areas

Resource Area	*No Action Alternative*	*Alternative 1 (Preferred Alternative)*	*Alternative 2*
Bathymetry	No changes to bathymetry in the project area.	Long-term, minor impacts on bathymetry at Berths 11, 12, and 13 due to permanent removal of river bottom. The Proposed Action would not affect navigation in the Piscataqua River.	Long-term, minor impacts on bathymetry at Berths 11, 12, and 13 due to permanent removal of river bottom. Temporary and minor impacts on bathymetry at Dry Dock 3 as a result of dredging and fill during construction. The Proposed Action would not affect navigation in the Piscataqua River.
Cultural Resources	No change to existing cultural resources in the project area.	No adverse effect on archaeological resources. Replacement of the Dry Dock 3 caisson would result in an adverse effect to Dry Dock 3, a contributing resource within the Portsmouth Naval Shipyard Historic District. The Navy has determined that no other architectural resources in the Areas of Potential Effect for the waterfront improvement projects would be adversely affected. The Navy is consulting with the Maine SHPO and ACHP regarding the finding of an adverse effect, and execution of a Memorandum of Agreement is anticipated. No traditional cultural properties have been identified at the Shipyard. The Navy is consulting with federally recognized tribes regarding the Proposed Action under Alternative 1.	No adverse effect on archaeological resources. Replacement of the Dry Dock 3 caisson would result in an adverse effect to Dry Dock 3, a contributing resource within the Portsmouth Naval Shipyard Historic District. The Navy has determined that no other architectural resources in the Areas of Potential Effect for the waterfront improvement projects would be adversely affected. A separate consultation with the Maine SHPO and ACHP regarding the Dry Dock 3 caisson replacement would be required if this alternative is implemented due to the different in-water construction method. No traditional cultural properties have been identified at the Shipyard.
Biological Resources	No change to estuarine biological resources.	Minor impacts on marine vegetation, fish (including managed essential fish habitat [EFH] species), benthic habitat and species, as a result of disturbance, including from turbidity and in-water noise, and limited mortality during construction and long-term loss of benthic and open water habitat.	Impacts resulting from increased pile driving and construction of the temporary cofferdam at Dry Dock 3 would occur over a longer duration and affect a slightly larger area. Overall short- and long-term impacts would be similar to those under Alternative 1 and would be minor. A separate

Table 4.11-1 Summary of Potential Impacts on Resource Areas

Resource Area	*No Action Alternative*	*Alternative 1 (Preferred Alternative)*	*Alternative 2*
		In-water noise would not result in long-term adverse effects or significant impacts on marine mammals. The Navy would implement various mitigation measures to reduce the number of marine mammals potentially affected by in-water noise. Alternative 1 may affect, but is not likely to adversely affect, two species listed under the ESA, the Atlantic sturgeon and the shortnose sturgeon. The Navy is consulting with NOAA Fisheries Service on the potential effects to listed species under Alternative 1.	consultation with NOAA Fisheries Service under section 7 of the ESA would be required if Alternative 2 is implemented.
Visual Resources	No change to existing visual resources.	Minor to moderate short-term visual impacts during construction and overall minor long-term visual impacts. Short-term impacts would cease once construction is complete. No significant impacts on visual resources.	Minor to moderate short-term visual impacts during construction and overall minor long-term visual impacts. Short-term impacts would cease once construction is complete. No significant impacts on visual resources.
Noise	No change in existing ambient noise levels. Continued noise from Shipyard operations.	Temporary increase in ambient noise levels during daytime hours, and minor to moderate impacts at nearest sensitive receptors.	Temporary and intermittent increase in ambient noise levels during daytime hours, and moderate impacts at nearest sensitive receptors. Increases in ambient noise levels during construction would be greater than under Alternative 1 because of the increase in pile driving at Berths 11, 12, and 13 and construction/removal of the temporary cofferdam at Dry Dock 3.

Table 4.11-1 Summary of Potential Impacts on Resource Areas

Resource Area	*No Action Alternative*	*Alternative 1 (Preferred Alternative)*	*Alternative 2*
Infrastructure	No changes to existing infrastructure at the Shipyard.	Short- and long-term minor impacts on stormwater management during construction and as a result of expansion of the fitting-out pier deck. Short-term, minor impacts on solid waste management resulting from disposal of dredge spoils. No long-term changes in utility demand would result.	Short- and long-term minor impacts on stormwater management during construction and as a result of expansion of the fitting-out pier deck. Greater but still short-term, minor impacts on solid waste management resulting from disposal of dredge spoils from the berths and Dry Dock 3. No long-term changes in utility demand would result.
Transportation	No change to existing transportation conditions.	Temporary, minor increases in vehicle traffic during construction, no significant impact.	Temporary, minor increases in vehicle traffic during construction. Average peak and daily vehicle trips would be slightly higher under Alternative 2. No significant impact on transportation.
Hazardous Materials and Waste	No change associated with hazardous materials and wastes.	Negligible impacts from handling of hazardous materials, generation and management of hazardous waste and handling of materials with special hazards. Small quantities of materials and wastes would be handled. The Navy and contractors would comply with a framework of federal/state regulations and Navy procedures.	Negligible impacts from handling of hazardous materials, generation and management of hazardous waste and handling of materials with special hazards, Small quantities of materials and wastes would be handled. The Navy and contractors would comply with a framework of federal/state regulations and Navy procedures.

Table 4.11-2 Impact Avoidance And Minimization Measures

Measure	*Anticipated Benefit*	*Evaluating Effectiveness (To be determined as consultations progress)*	*Implementing and Monitoring (To be determined as consultations progress)*	*Responsibility*	*Estimated Completion Date*
Alternative 1 (Preferred Alternative)					
Compliance with individual USACE Permit and MEDEP individual NRPA Permit for in-water work at Berths 11, 12, and 13	Will reduce impacts on surface water quality during construction			Construction contractor and Navy Public Works Department - Maine	October 2022
Compliance with the MEDEP Water Quality Certification, issued as part of the NRPA permitting process, for in-water work at Berths 11, 12, and 13	Will reduce impacts on surface water quality during from dewatering operations			Construction contractor and Navy Public Works Department - Maine	October 2022
Compensatory mitigation (in-lieu fee) under Maine In-Lieu Fee Compensation Program for permanent fill at Berths 11, 12, and 13	Will increase the extent and quality of protected state natural trust resources			Navy Public Works Department - Maine	October 2016
Compliance with requirements of the Memorandum of Agreement with the Maine SHPO	Will minimize adverse effects on Dry Dock 3 in accordance with Section 106			Navy Public Works Department - Maine	August 2018

Table 4.11-2 Impact Avoidance And Minimization Measures

Measure	*Anticipated Benefit*	*Evaluating Effectiveness (To be determined as consultations progress)*	*Implementing and Monitoring (To be determined as consultations progress)*	*Responsibility*	*Estimated Completion Date*
Compliance with ICRMP procedures for unanticipated discoveries of archaeological resources	Will reduce the risk of adverse effect on previously unidentified archaeological resources			Navy Public Works Department – Maine	October 2022
Mitigation measures under IHAs issued for each year of in-water construction	Will reduce risk of impacts on marine mammals as a result of pile driving during in-water construction at Berths 11, 12, and 13			Construction contractor and Navy Public Works Department - Maine	October 2022
Lobster relocation at Berths 11, 12, and 13	Will reduce risk of impacts on lobsters			Navy Public Works Department – Maine	October 2022
Alternative 2					
Compliance with individual USACE Permit and MEDEP individual NRPA Permit for in-water work at Berths 11, 12, and 13	Will reduce impacts on surface water quality during construction			Construction contractor and Navy Public Works Department - Maine	October 2022
Compliance with the MEDEP Water Quality Certification, issued as part of the NRPA permitting process, for in-water work at Berths 11, 12, and 13 and Dry Dock 3	Will reduce impacts on surface water quality during from dewatering operations			Construction contractor and Navy Public Works Department - Maine	October 2022

Table 4.11-2 Impact Avoidance And Minimization Measures

Measure	*Anticipated Benefit*	*Evaluating Effectiveness (To be determined as consultations progress)*	*Implementing and Monitoring (To be determined as consultations progress)*	*Responsibility*	*Estimated Completion Date*
Compensatory mitigation (in-lieu fee) under Maine In-Lieu Fee Compensation Program for temporary and permanent fill at Dry Dock 3 and Berths 11, 12, and 13	Will increase the extent and quality of protected state natural trust resources			Navy Public Works Department - Maine	October 2016
Compliance with existing MPDES permit and Maine Waste Discharge License	Will reduce impacts on surface water resulting from dewatering operations for the temporary cofferdam			Construction contractor	August 2018
Compliance with Category II USACE general permit and MEDEP individual NRPA Permit for in-water work at Dry Dock 3	Will reduce impacts on surface water associated with the fill for the temporary cofferdam			Construction contractor and Navy Public Works Department - Maine	August 2018
Compliance with requirements of the Memorandum of Agreement with the Maine SHPO	Will minimize adverse effect on Dry Dock 3 in accordance with Section 106			Navy Public Works Department - Maine	August 2018
Compliance with ICRMP procedures for unanticipated discoveries of archaeological resources	Will reduce the risk of adverse effect tonpreviously unidentified archaeological resources			Navy Public Works Department – Maine	October 2022

Table 4.11-2 Impact Avoidance And Minimization Measures

Measure	*Anticipated Benefit*	*Evaluating Effectiveness (To be determined as consultations progress)*	*Implementing and Monitoring (To be determined as consultations progress)*	*Responsibility*	*Estimated Completion Date*
Mitigation measures under IHAs issued for each year of in-water construction	Will reduce risk of impacts on marine mammals as a result of pile driving during in-water construction at Berths 11, 12, and 13 and Dry Dock 3			Construction contractor and Navy Public Works Department - Maine	October 2022
Lobster relocation at Berths 11, 12, and 13	Will reduce risk of impacts on lobsters			Navy Public Works Department – Maine	October 2022

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5 Cumulative Impacts

This section 1) defines cumulative impacts, 2) describes past, present, and reasonably foreseeable future actions relevant to cumulative impacts, 3) analyzes the incremental interaction the Proposed Action may have with other actions, and 4) evaluates cumulative impacts potentially resulting from these interactions.

5.1 Definition of Cumulative Impacts

The approach taken in the analysis of cumulative impacts follows the objectives of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, and CEQ guidance. Cumulative impacts are defined in 40 Code of Federal Regulations (CFR) section 1508.7.

Cumulative impacts refer to the impacts on the environment that result from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

To determine the scope of environmental impact statements and environmental assessments, agencies shall consider cumulative actions, which when viewed with other Proposed Actions have cumulatively significant impacts and should therefore be discussed in the same impact statement.

In addition, the CEQ and U.S. Environmental Protection Agency (USEPA) have published guidance addressing implementation of cumulative impact analyses: Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (CEQ, 2005) and Consideration of Cumulative Impacts in EPA Review of NEPA Documents (USEPA, 1999). CEQ guidance entitled Considering Cumulative Impacts under NEPA (1997) states that cumulative impact analyses should:

> ". . . determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative impacts of other past, present, and future actions . . . identify significant cumulative impacts…[and]…focus on truly meaningful impacts."

Cumulative impacts are most likely to arise when a relationship or synergism exists between a Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or close to the Proposed Action would be expected to have more potential for a relationship than those more geographically separated. Similarly, relatively concurrent actions would tend to offer a higher potential for cumulative impacts. To identify cumulative impacts, the analysis needs to address the following three fundamental questions.

- Does a relationship exist such that affected resource areas of the Proposed Action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
- If one or more of the affected resource areas of the Proposed Action and another action could be expected to interact, would the Proposed Action affect or be affected by impacts of the other action?
- If such a relationship exists, then does an assessment reveal any potentially significant impacts not identified when the Proposed Action is considered alone?

5.2 Scope of Cumulative Impacts Analysis

The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For this environmental assessment (EA), the study area delimits the geographic extent of the cumulative impacts analysis. In general, the study area will include those areas previously identified in Chapters 3 and 4 for the respective resource areas. The time frame for cumulative impacts centers on the timing of the Proposed Action, which would be implemented between October 2016 and October 2022.

Another factor influencing the scope of cumulative impacts analysis involves identifying other actions to consider. Beyond determining that the geographic scope and time frame for the actions interrelate to the Proposed Action, the analysis employs the measure of "reasonably foreseeable" to include or exclude other actions. For the purposes of this analysis, public documents prepared by federal, state, and local government agencies form the primary sources of information regarding reasonably foreseeable actions. Documents used to identify other actions include notices of intent for EISs and EAs, management plans, land use plans, and other planning-related studies.

5.3 Past, Present, and Reasonably Foreseeable Actions

This section will focus on past, present, and reasonably foreseeable future projects at and near Portsmouth Naval Shipyard. In determining which projects to include in the cumulative impacts analysis, a preliminary determination was made regarding the past, present, or reasonably foreseeable action. Specifically, using the first fundamental question included in Section 5.1, it was determined whether a relationship exists such that the affected resource areas of the Proposed Action (included in this EA) might interact with the affected resource area of a past, present, or reasonably foreseeable action. If no such potential relationship exists, the Project was not carried forward into the cumulative impacts analysis. In accordance with CEQ guidance (CEQ, 2005), these actions considered but excluded from further cumulative effects analysis are not catalogued here as the intent is to focus the analysis on the meaningful actions relevant to inform decision-making. Projects included in this cumulative impacts analysis are listed in Table 5.3-1 and briefly described in the following subsections. The locations of these projects are shown in Figures 5.3-1 and 5.3-2.

5.3.1 Past Actions

5.3.1.1 Portsmouth Naval Shipyard

Dry Dock 1 Improvements

This project replaced the deteriorated, exterior layer of concrete throughout the dry dock and removed other dry dock components, including the keel block track system. Several access staircases and utility galleries along the north and south walls were removed and replaced. Two pump gates on the outside face of the dry dock were removed and rebuilt, and the existing pump well was repaired. Mechanical utilities around the dry dock were replaced, and a permanent test power facility and 480-volt industrial load center were constructed. A temporary cofferdam was constructed outside of the dry dock, requiring dredging of the cofferdam footprint, to allow the repairs to be completed in a dry environment (Navy, 2011). Dry Dock 1 is eligible for listing on the National Register of Historic Places (NRHP). This project was awarded in 2011, and construction was completed in 2013.

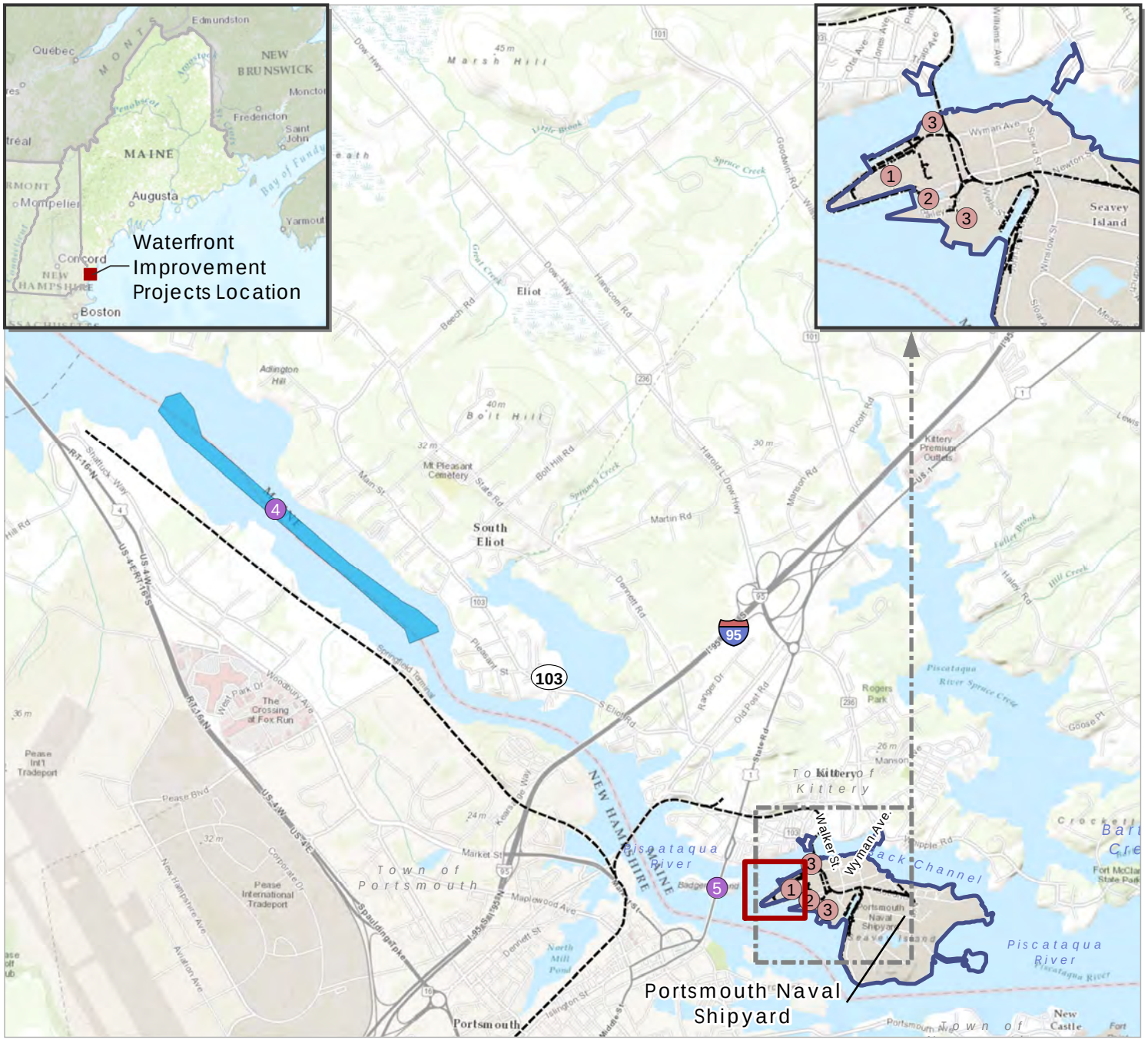

Figure 5.3-1
Past Actions
Portsmouth Naval Shipyard
York County, Maine

Legend

Project Area

Installation Area

Navigation Channel

Portsmouth Naval Shipyard

1 Construction of a Consolidated Waterfront Support Facility (Building 174)

2 Dry Dock 1 Improvements

3 Buildings 178 and 55 Energy and Structural Repairs

Other Federal and Non-Federal Actions

4 Federal Navigation Channel Maintenance Dredging

5 Memorial Bridge Replacement

Railroad

N

0 2,000 4,000 6,000 8,000 Feet

Source: ESRI 2013; Department of Defense 2014; Maine Department of Transportation 2011.

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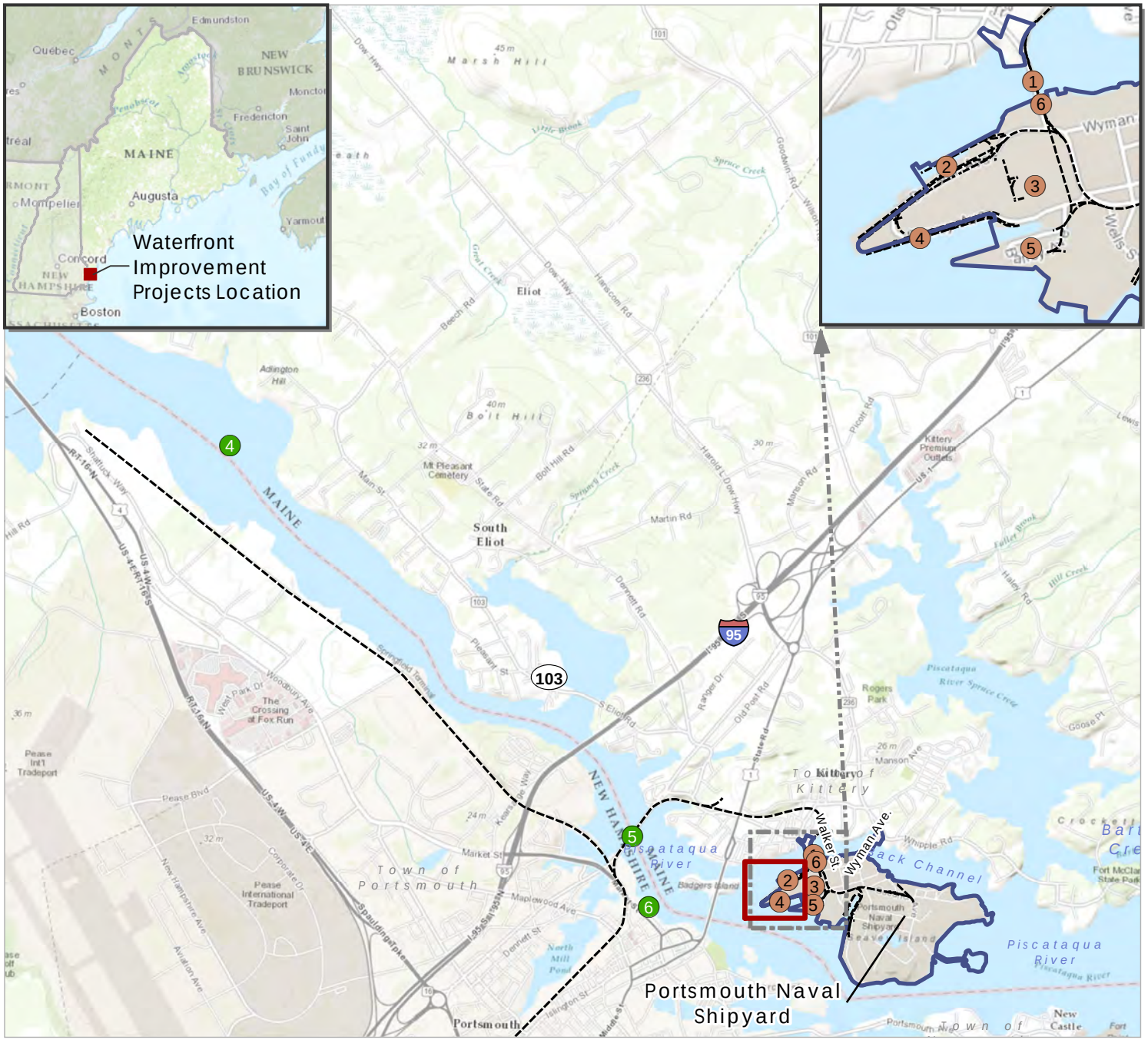

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Figure 5.3-2
Present and Reasonably Foreseeable Future Actions
Portsmouth Naval Shipyard
York County, Maine

Legend

- Project Area
- Installation Area
- Railroad

Portsmouth Naval Shipyard

1. Bridge 1 Structural Repairs
2. Dry Dock 3 Pump Well Repairs
3. Consolidation of Structural Shops (Building 92)
4. Waterfront Utilities Improvements
5. Dry Dock #3 Reactor Servicing Complex
6. Paint, Blast, and Rubber Facility Consolidation

Other Federal and Non-Federal Actions

4. Portsmouth Harbor Turning Basin Expansion
5. Sarah Mildred Long Bridge Replacement
6. New Hampshire Port Authority Main Wharf Expansion

N

0 2,000 4,000 6,000 8,000 Feet

Source: ESRI 2013; Department of Defense 2014.

Table 5.3-1 Cumulative Action Evaluation

Action	*Level of NEPA Analysis Completed*
Past Actions	
Portsmouth Naval Shipyard	
Construction of a Consolidated Waterfront Support Facility	EA
Dry Dock 1 Improvements	Categorical Exclusion (CATEX)
Buildings 178 and 55 Energy and Structural Repairs	EA
Other Federal and Non-federal Actions	
Federal Navigation Channel Maintenance Dredging	EA
Memorial Bridge Replacement	CATEX
Present and Reasonably Foreseeable Future Actions	
Portsmouth Naval Shipyard	
Bridge 1 Structural Repairs	EA
Dry Dock 3 Pump Well Repairs	EA
Consolidation of Structural Shops	EA
Waterfront Utilities Improvements	CATEX (in progress)
Dry Dock 1 Reactor Servicing Complex	CATEX (in progress)
Paint, Blast, and Rubber Facility Consolidation	EA (in progress)
Other Federal and Non-federal Actions	
Portsmouth Harbor Turning Basin Expansion	EA
Sarah Mildred Long Bridge Replacement	CATEX
New Hampshire Port Authority Main Wharf Expansion	None

Sources: U.S. Army Corps of Engineers February 21, 2012; Permitting Dashboard n.d.

Buildings 178 and 55 Energy and Structural Repairs

Critical building renovations, energy-efficiency upgrades, and structural modernizations have been completed at Buildings 178 and 55. The Navy rehabilitated the exteriors of both buildings, repaired structurally unsafe areas, and implemented energy improvement measures so that the buildings could be adapted and reused. Building 178 was modernized to create a consolidated, state-of-the-art industrial-material-handling facility, and Building 55 was adapted into a consolidated tool crib and storage facility. The project included filling the inclined floor—an historic shipway—at the southern end of Building 178 to be level with the floor in the northern part of the building and installing a concrete seawall immediately inside the existing doors at the south end of the building. Part of the construction area was located below the mean high water mark, and a temporary small-diameter cellular cofferdam was installed outside of Building 178 during construction (Navy, 2011).

Renovation of Building 178 began in 2012 and was completed in 2014. Renovation of Building 55 began in 2012 and was completed in 2013. Building 55 is listed in the NRHP, and Building 178 is eligible for listing in the NRHP(Navy, 2011).

Construction of a Consolidated Waterfront Support Facility

This project modernized the waterfront support facilities at Dry Dock 3 by improving Building 174, constructing an addition to Building 175, and demolishing excess facility space. Building 175 is eligible for listing on the NRHP (Navy, 2011). Construction began in 2011 and was completed in December 2012.

5.3.1.2 Other Federal and Non-Federal Actions

Federal Navigation Channel Maintenance Dredging

In 2013, the U.S. Army Corps of Engineers (USACE) dredged part of the navigation channel in the Piscataqua River known as the Simplex Shoals to maintain an adequate depth for safe navigation (USACE, 2012). The USACE prepared an EA to analyze alternatives for periodic and advance maintenance dredging of the shoals. Advance maintenance dredging of the channel was completed to a depth of 40 feet with 2 feet of allowable over-depth dredging. Advance maintenance dredging is used in areas where shoaling constricts navigation and can extend the time period between maintenance dredging projects. The USACE plans to complete future periodic maintenance dredging of the navigation channel on a schedule of every 6 to 10 years (USACE, 2012).

Memorial Bridge Replacement

The New Hampshire Department of Transportation (DOT), in cooperation with the Federal Highway Administration and the Maine DOT, recently replaced the Memorial Bridge over the Piscataqua River, including its components: the Memorial Bridge lift span and flanking spans, the Kittery approach spans, and the Scott Avenue bridge (Portsmouth approach). The replacement of the bridge created an adverse effect on numerous historic properties, including the Memorial Bridge itself (Three Spans, Portsmouth, and Kittery), the Memorial Bridge Historic District, Memorial Park, Scott Avenue Bridge, Portsmouth Historic District, and John Paul Jones Memorial Park. Mitigation was agreed upon through a Memorandum of Agreement (MOA), signed in March 2011.

In March 2011, the New Hampshire DOT completed a Class II categorical exclusion for complete replacement of the Memorial Bridge superstructure, pursuant to NEPA. Demolition of the existing Memorial Bridge and construction of the replacement bridge occurred between 2012 and 2013. The replacement bridge was completed and opened in August 2013 (New Hampshire DOT, 2013).

The replacement project included removing the north and south bridge piers of the Memorial Bridge lift span and replacing them with two new piers in the same locations as the existing piers. The new piers are wider in order to accommodate an increase in the width of the bridge from 28 feet to 32 feet. The two middle piers have been repaired, and four dolphins were installed in front of these piers. The nine piers of the Kittery approach spans have also been removed to a point below the river substrate or to bedrock. The north abutment of the Kittery approach spans was removed and replaced with a new, wider abutment near its existing location (New Hampshire DOT, 2011).

5.3.2 Present and Reasonably Foreseeable Actions

5.3.2.1 Portsmouth Naval Shipyard

Bridge 1 Structural Repairs

Recent inspections have confirmed that Bridge 1, the primary vehicular, bicycle, and pedestrian bridge and sole railway bridge to Seavey's Island, is deteriorating. The structural integrity of the bridge must be restored to maintain the sole rail access to the Shipyard and ensure that the Shipyard can continue to achieve its mission to service the Navy's submarine fleet. The structural repairs to the bridge entail removing the entire bridge superstructure, including the deck and deck supports; reinforcing the bridge foundations; and constructing a new superstructure with improved sight lines and approaches, wider lanes, and safety features. The existing bridge foundations would be reinforced with micropiles installed in the bedrock beneath the bridge, through cores removed from the existing foundations, and cladding.

A small amount of fill in the Back Channel will be required to install the cladding. Use of the existing foundations would minimize the amount of in-water work required for this project.

Bridge 1 is eligible for listing in the NRHP. The repairs began in fiscal year (FY) 2015 and are expected to take approximately two years to complete (Navy, 2014).

Dry Dock 3 Pump Well Repairs

Repair or replacement of the pump well at Dry Dock 3 is necessary to secure worker safety and preserve the dry dock's operations and certification. The structure is deteriorating, and salt water intrusion has caused acute damage to dewatering pumps, motors, and heating, ventilation, and dehumidification systems, and failure of electric actuators and motor controls in rarer instances. Dry Dock 3 is eligible for listing in the NRHP (Navy, 2014). Repairs to the interior of the dry dock began in the fall of 2015.

Consolidation of Structural Shops

This project will construct a 51,500 square-foot addition to Building 92, which is eligible for listing in the NRHP; demolish vacant facilities; and relocate and consolidate shop functions (Portsmouth Naval Shipyard, 2012). Construction is ongoing and is expected to be completed in 2016.

Waterfront Utilities Improvements

This project would improve utilities on the fitting-out and flat-iron piers to support operations at Dry Docks 1 and 3; Berths 1, 2, 11, 12, and 13; and associated waterfront facilities. This would require removing and replacing old underground utility lines in existing conduits, repairing associated utility infrastructure, constructing electrical substations to support operations at Dry Dock 3, and constructing a utility tunnel at Berth 11. Construction would begin in June 2017 and be completed by May 2019.

Dry Dock 1 Reactor Servicing Complex

A reactor servicing complex would be constructed to support operations at Dry Dock 1. The reactor servicing complex would consist of prefabricated equipment that would be installed and interconnected on-site to provide enclosed industrial work space in a steel-framed structure. The Dry Dock 1 reactor servicing complex would encompass approximately 19,900 square feet and would be constructed almost entirely on the concrete slab foundation of Building 155, which is scheduled to be demolished under a separate project. Construction of the reactor servicing complex would enable Dry Dock 1 to serve as a second defueling dry dock for the Shipyard. Construction would begin in May 2017 and be completed by August 2019.

Paint, Blast, and Rubber Facility Consolidation

The project would consolidate paint, blast, and rubber manufacturing with plastic molding operations in one location within the Shipyard's controlled industrial area (CIA) by constructing a new facility, converting existing buildings, and demolishing excess building footprint. The new facility would consist of high- and low-bay industrial shop areas, as well as offices, break rooms, locker rooms, and training and support spaces. Buildings 55, 60, and 74 would be converted to support industrial, maintenance, and administrative functions. The project would relocate and consolidate Shop 06 into Building 60. Buildings 285, 362, 400, 151, the west addition of Building 74, and the east addition of Building 60 would be demolished.

5.3.2.2 Other Federal and Non-federal Actions

Portsmouth Harbor Turning Basin Expansion (Portsmouth Harbor and Piscataqua River Navigation Improvement Project)

The Pease Development Authority and the USACE are proposing to expand the turning basin in Portsmouth Harbor from a width of 800 feet to a width of 1,200 feet (McMenemy, 2014). The turning basin is located approximately 4 miles upriver from Portsmouth Naval Shipyard. The project would increase navigational safety, reduce costs for turning vessels and freeing grounded vessels, and allow large bulk carriers to access the port's upper terminals (USACE, 2014). The USACE has completed a draft EA for the project and expects to complete design plans and specifications for the project by September 2016 (McMenemy, 2014; Keegan, 2015). Construction could begin as early as 2017 and is expected to take less than one year to complete (Keegan, 2015).

Sarah Mildred Long Bridge Replacement

The Maine DOT and New Hampshire DOT are proposing to replace the Sarah Mildred Long Bridge in conjunction with replacement of the Memorial Bridge. Construction of the new bridge began in January 2015 and is expected to be complete in late 2017 (Scardina, 2015). The new, 2,631-foot-long bridge will be constructed with two levels, one for vehicle traffic and one for rail traffic. The bridge will be constructed on piers supported by spread footings or drilled shafts. Fender protection systems, consisting of cell-filled cofferdams supported on pilings, will be constructed around the piers (Maine DOT and New Hampshire DOT, n.d.).

The project includes removing the existing Sarah Mildred Long Bridge and abutment. The piers supporting the existing bridge will be removed to various depths depending on their locations (Maine DOT and New Hampshire DOT, n.d.).

Constructing the new bridge and demolishing the existing bridge will require constructing temporary causeways and trestles in some locations. The temporary causeways will be constructed of washed riprap placed on geotextile fabric. The temporary trestles will be constructed on driven piles (Maine DOT and New Hampshire DOT, n.d.).

New Hampshire Port Authority Main Wharf Expansion

The New Hampshire Port Authority Main Wharf is located between the Memorial Bridge and the Sarah Mildred Long Bridge in Portsmouth (off Market Street). The New Hampshire Port Authority is proposing to expand the wharf by rehabilitating and lengthening it by 125 feet to increase its capacity and enable it to accommodate larger vessels and constructing a 24-square-foot offshore mooring dolphin (Pease Development Authority, 2014). The expansion project also would replace the deteriorating bridges that provide access to the wharf from the shoreline by expanding the wharf deck over the open water area between the shoreline and shore side of the existing wharf. The shore side wharf expansion will consist of "concrete framing members supported by steel caissons and a pile supported concrete curtain wall with riprap along the shore" (Pease Development Authority, 2014).

The 95-percent design for the wharf expansion is completed, and all the necessary permits for the project have been obtained. The Pease Development Authority applied for Transportation Investment Generating Economic Recovery (TIGER)grant funding in 2015 for the project but was unsuccessful (Pease International Division of Ports and Harbors, 2015). If funding is obtained for the project, the Pease Development Authority would prepare an EA to analyze potential environmental impacts (Elwood, 2015).

5.4 Cumulative Impact Analysis

Where feasible, cumulative impacts were assessed using quantifiable data; however, for many of the resources included for analysis, quantifiable data are not available, and a qualitative analysis was therefore undertaken. In addition, where an analysis of potential environmental effects for future actions has not been completed, assumptions were made regarding cumulative impacts related to this EA where possible. The analytical methodology presented in Chapter 4, which was used to determine potential impacts on the various resources analyzed in this document, was also used to determine cumulative impacts.

5.4.1 Air Quality

5.4.1.1 Description of Geographic Study Area

The Region of Influence (ROI) for cumulative air quality impacts is the Metropolitan Portland (MP) Intrastate Air Quality Control Region. This area is in attainment for all criteria pollutants (USEPA, 2015b). The MP IAQCR had previously been designated nonattainment for the 1997 ozone standard and has been subject to a maintenance plan under that standard; however, on March 6, 2015, USEPA revoked the 1997 8-hour ozone National Ambient Air Quality Standard (80 FR 12264; *Federal Register* 2015).

5.4.1.2 Relevant Past, Present, and Future Actions

Each of the construction projects listed in Section 5.3 would result in temporary emission increases. Because the emissions of these projects and the Proposed Action itself would be dispersed over time and area, they are not likely to contribute to cumulative significant impacts on air quality within the ROI.

5.4.1.3 Cumulative Impact Analysis

Cumulative air quality impacts from past, present, and future construction actions within the ROI would be less than significant because these emissions would be local and temporary. None of the other projects identified in Section 5.3 would result in significant new sources of long-term emissions. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects would not result in significant impacts on air quality within the ROI.

Greenhouse gas (GHG) emissions occur locally, but GHG impacts and climate change are both global in scale and cumulative over time. The Navy has established GHG-reduction goals, described in Chapter 3. GHG emissions from the Proposed Action would be minimal and temporary, and implementation of the Proposed Action would reduce the risk of damage to the Shipyard from increased sea level rise and storm surges. Therefore, the Proposed Action would not contribute to cumulative negative impacts from GHG emissions or climate change.

5.4.2 Water Resources

5.4.2.1 Description of Geographic Study Area

The ROI for cumulative impacts on water resources, including surface water, wetlands, floodplains, and marine sediments, encompasses the Great Bay estuary and lower Piscataqua River from the Great Bay to the mouth of the Piscataqua River. Although the Proposed Action would only result in localized, temporary impacts on water resources during construction, a larger ROI was considered to account for projects that would potentially result in more widespread impacts.

5.4.2.2 Relevant Past, Present, and Future Actions

The present and reasonably foreseeable projects identified in Section 5.3, with the exception of the Portsmouth Harbor turning basin expansion, could have cumulative impacts on water resources with the Proposed Action. The past projects identified in Section 5.3 would not cause cumulative impacts because impacts on water resources as a result of these projects were temporary and ended before the start of the construction period for the Proposed Action.

Dredging and improvements to the Piscataqua River federal navigation channel at the Simplex Shoals, approximately 2 miles upriver of the Project area, and the turning basin approximately 4 miles upriver, would not result in cumulative impacts on water resources because of the distance of these sites from the Project area. While these dredging projects would have water quality impacts similar to the proposed in-water projects i.e., resulting in increased turbidity and decreased dissolved oxygen concentrations near the dredging operations, turbidity and re-suspended sediments would be expected to quickly settle out of the water column or return to background levels within a short distance of the dredging operations. Dredge spoils from the turning basin expansion would be placed at the Isles of Shoals North placement site, approximately 10 miles offshore of the Maine coast (USACE, February 8, 2015). Dredge spoils may also be used for shoreline improvement projects at Wells, Maine, approximately 20 miles northeast of the Shipyard, and several towns in New Hampshire (USACE, February 8, 2015). Placement of dredged sediments at these sites also would not result in cumulative impacts. Periodic maintenance dredging of the Simplex Shoals in the Piscataqua River federal navigation channel, if this dredging occurs at the same time as in-water construction at the Shipyard, would not result in cumulative impacts for the reasons noted above. The Simplex Shoals and in-river disposal site historically used as the placement site for dredge spoils from the shoals are both located more than 2 miles upriver from the Project area (USACE, 2012).

5.4.2.3 Cumulative Impact Analysis

The Navy and non-Navy projects listed above would result in similar impacts on surface water as those of the Proposed Action. In-water projects occurring outside of the Project area, such as the Sarah Mildred Long Bridge replacement and New Hampshire Port Authority Main Wharf Expansion, would temporarily re-suspend sediments in the vicinity of in-water construction activities, resulting in localized increases in turbidity and decreased dissolved oxygen concentrations. These impacts on water quality would be localized, and turbidity and dissolved oxygen levels would be expected to return to background levels within a short distance of the in-water construction areas as a result of the strong tidally influenced river currents and riverine transport. In addition, turbidity controls would be used during construction at the Sarah Mildred Long Bridge, reducing the area potentially impacted (Maine Department of Transportation, n.d.). Therefore, the two non-Navy projects would not cumulatively impact surface water quality when considered in relationship to the Proposed Action.

The ongoing Bridge 1 structural repairs at the Shipyard would occur near the Project area for the Proposed Action. However, the structural repairs would not disturb bottom sediments in the Back Channel of the Piscataqua River and therefore would not be expected to result in cumulative impacts on water quality with the proposed in-water work at Berths 11, 12, and 13 or the Dry Dock 3 caisson (Navy, 2014). This project, furthermore, is expected to be complete before the start of the proposed action.

The upland construction projects noted above that are ongoing or planned at the Shipyard could result in cumulative, minor, and temporary impacts on surface water quality with the Proposed Action as a result of sedimentation, spills, or release of construction debris into the river. These impacts would be

avoided or minimized through use of standard best management practices (BMPs); implementation of project-specific Spill Prevention, Control, and Countermeasures (SPCC) plans; and compliance with the Shipyard's existing MPDES permit; the Maine Erosion and Sedimentation Control Law; and project-specific Natural Resources Protection Act permits, as required.

The proposed in-water projects would result in temporary, localized impacts on wetlands in the vicinity of the Project area. The structural repairs to Bridge 1 could result in cumulative impacts on these wetlands as a result of temporary impacts on water quality, if in-water construction at Bridge 1 occurs at the same time as in-water construction at Berth 11 or the Dry Dock 3 caisson. The Proposed Action is not expected to result in cumulative impacts on wetlands with the other non-Navy in-water projects noted above. Although the Sarah Mildred Long Bridge replacement project would permanently impact approximately 46,000 square feet of tidal wetlands and their buffers in the lower Piscataqua River (Maine Department of Transportation, n.d.), the Proposed Action would not substantially contribute cumulatively to this impact because of the temporary and indirect nature of potential wetland impacts resulting from the Proposed Action.

Because the Proposed Action would not result in impacts on the floodplain in the Project area, the Proposed Action would not contribute to cumulative impacts on floodplains.

The in-water projects that would result in temporary and permanent impacts on marine sediments as a result of pile driving, temporary and permanent filling, or dredging include the Sarah Mildred Long Bridge replacement and the New Hampshire Port Authority Main Wharf expansion. The Proposed Action would not contribute substantially to short-term impacts of marine sediments as a result of disturbance during construction because marine sediments adjacent to in-water construction areas would return to pre-construction conditions within a short time following the end of construction. Marine sediments next to Berths 11, 12, and 13 are periodically disturbed by maintenance dredging of these berths, and short-term impacts resulting from the Proposed Action would be similar to these periodic disturbances.

The Proposed Action would result in permanent loss of marine sediments in an area of up to approximately 118,800 square feet if Option 1 for the Berths 11, 12, and 13 structural repairs is implemented. The Sarah Mildred Long Bridge replacement and New Hampshire Port Authority Main Wharf expansion also would result in permanent loss of marine sediments. Up to approximately 29,000 square feet of marine sediments would be permanently filled during construction of the New Hampshire Port Authority Main Wharf expansion (Pease Development Authority, 2014). The area of marine sediments potentially impacted by the Sarah Mildred Long Bridge replacement is not publicly available. The Proposed Action with the two other in-water construction projects would contribute to long-term cumulative impacts on marine sediments in the lower Piscataqua River as a result of fill; however, these impacts would be minor given the abundance of similar marine substrates in the lower estuary that are of similar or better quality.

5.4.3 Bathymetry

5.4.3.1 Description of Geographic Study Area

The ROI for cumulative impacts on geologic resources is Portsmouth Harbor.

5.4.3.2 Relevant Past, Present, and Future Actions

Each of the past, present, or reasonably foreseeable in-water construction projects identified in Section 5.3 could result in temporary cumulative impacts on bathymetry with the Proposed Action.

5.4.3.3 Cumulative Impact Analysis

Cumulative impacts on bathymetry from past, present, and future actions within the ROI would be less than significant because impacts would be localized and similar to the level of temporary disturbance of bathymetry occurring regularly within the ROI. The in-water construction projects identified in Section 5.3 have or would result in changes to bathymetry in Portsmouth Harbor. In some cases, these changes would be localized, i.e., as a result of the Proposed Action and other construction projects at the Shipyard or replacement of the Memorial and Sarah Mildred Long bridges. Changes to bathymetry have occurred or would occur over a larger area as a result of the channel dredging and turning basin expansion projects. Portsmouth Harbor is a busy commercial port, and the federal navigation channel is periodically dredged and improved to maintain safe navigational depths. Similarly, berths and the entrances to the dry docks at the Shipyard are regularly dredged to allow safe vessel operations. Most of the identified in-water projects would result in changes to bathymetry that are within USACE-permitted design specifications. The proposed turning basin expansion, while resulting in long-term changes to bathymetry, would be subject to federal permitting and design review prior to construction and is expected to result in long-term benefits for navigation. The bridge replacement projects may result in long-term, localized changes in bathymetry as a result of construction of new infrastructure in the river. Any changes relevant to navigation would be communicated on navigational charts. Because of the distance of these projects from in-water construction areas adjacent to Berths 11, 12, and 13 and Dry Dock 3 and because these areas adjacent to the Shipyard are not open to general navigation, the Proposed Action, combined with the past, present, and reasonably foreseeable future projects discussed above, would not result in significant cumulative impacts within the ROI.

5.4.4 Cultural Resources

5.4.4.1 Description of Geographic Study Area

The ROI assessed for cumulative impacts on cultural resources is the Portsmouth Naval Shipyard (PNSY) Historic District.

5.4.4.2 Relevant Past, Present, and Future Actions

Each of the past, present, or reasonably foreseeable Navy projects described in Section 5.3.2 would have the potential to affect NRHP-listed or NRHP-eligible buildings within the historic district, including Bridge 1, Dry Docks 1 and 3, Buildings 7, 55, 60, 74, 92, and 151, and Berths 1, 2, 11, 12, and 13. Therefore, these actions could result in cumulative impacts with the Proposed Action.

Projects located outside the Shipyard, such as the Memorial Bridge Replacement, would not contribute to cumulative impacts on cultural resources in the PNSY Historic District, and, therefore, they are not considered as part of this evaluation.

5.4.4.3 Cumulative Impact Analysis

The Proposed Action would have an adverse effect on Dry Dock 3. An MOA will be developed for the proposed Dry Dock 3 caisson replacement, which will include mitigation measures to address the adverse effect(s) on this resource. Recordation and any other mitigation required by the Maine SHPO will reduce the potential adverse effect of the Proposed Action to a less-than-significant level. However, this mitigation does not eliminate the potential cumulative impact with projects that affect the appearance or existence of various historic buildings on the Shipyard.

Consultation with the Maine State Historic Preservation Office (SHPO) has been completed or is ongoing for each of the other Navy projects identified in Section 5.3; mitigation measures have been or would be addressed in stipulations in the MOA or as part of the findings for the individual projects. In order to mitigate adverse effects on Bridge 1, an MOA was signed between the Navy and the Maine SHPO in May 2014. This MOA outlined procedures to provide design oversight, a level II Maine Historic Engineering Record and other documentation, and review of unanticipated discoveries of artifacts and potential human remains (Navy, 2014). The MOA was intended to help offset the anticipated damage to the bridge itself and to the PNSY Historic District.

Repairs associated with the Dry Dock 3 pump wells would not have an adverse effect on historic properties. The repairs and replacements associated with this project were designed so as to not alter the character of Dry Dock 3 for which it had been determined eligible for listing on the NRHP (Crosby, n.d.). No specific mitigation measures were suggested in the Navy's findings for this project, as the potential effect was not anticipated to be adverse.

Similar to Bridge 1, in order to mitigate adverse effects on Building 92, an MOA was developed to address the design review, to document the structure as part of a Maine Historic Building Record, and to account for the unanticipated discovery of artifacts and potential human remains. The proposed alterations to the building were designed so as not to be obtrusive or to negatively impact the overall historic character of the PNSY Historic District and associated views (Portsmouth Naval Shipyard, 2012).

Improvements associated with the waterfront utilities project at the Shipyard would not be anticipated to have an adverse effect on historic properties. While construction may occur within the vicinity of Dry Dock 1 and Berths 1, 2, 11, 12, and 13, ground disturbance would be limited, and existing underground utility conduits would be used where possible. As the plans for this project develop, additional structures within the Shipyard may be directly or indirectly affected by the removal and replacement of old utility lines, as well as by the repair or construction of associated utility infrastructure. As these changes would minimally alter the character, visual setting, and/or fabric of the structures, no adverse effect would be anticipated. The Navy will consult with the Maine SHPO regarding the potential effects of the waterfront utilities improvements on historic properties and the PNSY Historic District as a whole.

Similarly, construction of a reactor servicing complex at the location of Building 155, which is scheduled to be demolished, would not be anticipated to have an adverse effect on historic properties. Ground disturbance within the footprint of Building 155 may affect potential remnants of Building 1, as well as the original shoreline, which may be present below the foundation slab. However, the Navy would minimize potential ground disturbance within this area of the Shipyard and would plan to monitor construction and, if needed, provide recordation of previously undocumented archaeological sites or features such as quay walls. As the plans for this project develop, additional structures may be directly or indirectly affected. However, as construction of the reactor servicing complex would minimally alter the character, visual setting, and/or fabric of the structures, no adverse effect would be anticipated. The Navy will consult with the Maine SHPO regarding the potential effects of the reactor servicing complex on historic properties and the PNSY Historic District as a whole.

The consolidation of paint, blast, and rubber fabrication operations to newly constructed and converted facilities, as well as the demolition of excess building footprint, may have an adverse effect on historic properties. This would result from the complete or partial demolition of Buildings 60, 74, 149, and 151. The conversion of Buildings 55, 60, and 74 may also result in an adverse effect on historic properties. The Navy will consult with the Maine SHPO regarding the potential effects of this proposed project on

historic properties and the PNSY Historic District as a whole, and project-specific mitigation measures will be developed during consultation.

Viewed as individual actions, the modification of one structure or building may not necessarily diminish the historic and architectural character of the Portsmouth Naval Shipyard Historic District. However, the continued modification or, in some cases, demolition of historic structures on the Shipyard could cumulatively impact the overall integrity of the Portsmouth Naval Shipyard Historic District. When combined with the past, present, and reasonably foreseeable future actions identified in Section 5.3, it is expected that the Proposed Action would contribute to cumulative adverse effects on historic architectural properties in the PNSY Historic District. These potential cumulative impacts would be offset by consultation with the Maine SHPO and incorporation of mitigation measures described in each of the individual MOAs or documentation of findings. With impact-minimization measures stipulated in the MOAs for each project, the cumulative impact is expected to be less than significant.

5.4.5 Biological Resources

5.4.5.1 Description of Geographic Study Area

For the purposes of evaluating cumulative impacts on biological resources, the ROI is defined as the Project area (see Section 4.5) as well as the marine and estuarine habitats 1 mile upstream and downstream of the Project area. Due to the transport of suspended sediment, propagation of underwater noise, and displacement of biological organisms beyond the Project area, marine and estuarine habitats up to approximately 1 mile upstream and downstream of the Shipyard have the potential to be cumulatively impacted in an adverse way by the Proposed Action when considered in relation to past, present, and future actions.

5.4.5.2 Relevant Past, Present, and Future Actions

One recently completed in-water project at the Shipyard, the Dry Dock 1 improvements, occurred within the Project area, and one ongoing project, the Dry Dock 3 pump well repairs, also is located within the Project area. Several additional Navy and non-Navy projects have been identified within the broader geographic study area. These projects have been evaluated for potential cumulative impacts on biological resources because the biological resources analyzed are not exclusive to the Project area. In particular, marine species may spend only a portion of their time within the Project area, using other areas and habitats within the region throughout their life history.

Buildings 178 and 55 energy and structural repairs, Bridge 1 structural repairs, Memorial and Sarah Mildred Long Bridge replacement projects, and New Hampshire Port Authority Main Wharf expansion could cumulatively impact species and habitat in the localized area surrounding the Shipyard through the transport of sediment, propagation of underwater noise, and displacement of organisms. The cumulative impacts analysis also considers the potential cumulative impacts of underwater noise generated by baseline vessel traffic in the ROI and the Proposed Action.

5.4.5.3 Cumulative Impact Analysis

The past projects identified in Section 5.4.5.2 that required in-water work (Dry Dock 1 improvements, Memorial Bridge Replacement, and Buildings 178 and 55 Energy and Structural Repairs) would have resulted in temporary disturbances to the marine environment in areas near the project locations. Based on the localized and temporary nature of impacts of these past actions; the rapid natural recovery

of benthic habitats; and the continued use of this area by marine mammals, fish, and benthic invertebrates, these past actions would have no cumulative impacts on biological resources with the Proposed Action.

The present and future projects described in Section 5.4.5.2 include several projects that overlap with the geographic study area for the Proposed Action, including replacement of the Sarah Mildred Long Bridge, structural repairs to Bridge 1, repairs to the Dry Dock 3 pump well, and expansion of the New Hampshire Port Authority wharf. The Dry Dock 3 pump well repairs would involve minimal in-water work and are not expected to contribute substantially to cumulative impacts on estuarine biological resources with the Proposed Action.

The three remaining projects listed above would create localized disturbance or alteration and/or loss of marine vegetation and benthic habitat within their respective area of impact. Localized disturbance associated with each project would temporarily increase turbidity and may affect fish foraging behaviors. Increased turbidity would be localized and is expected to be rapidly ameliorated by local currents and riverine transport. In addition, juvenile and adult fish are expected to avoid areas of disturbance. Fish are highly mobile and are expected to use similar nearby habitat for feeding and foraging during periods of disturbance. Habitat and prey are abundant in the region, and displaced species are expected to forage in other available nearby habitat such as the Great Bay estuary or lower Piscataqua River estuaries. In addition, marine vegetation and benthic species would quickly recolonize disturbed areas, and mobile species temporarily displaced would return. The potential loss of egg and larval stages of finfish during construction of the present and future actions would be minor when considered on a population level. Therefore, water quality impacts, disturbance of benthic habitat, fish displacement, and direct mortality resulting from present and future projects that do overlap with the Proposed Action's geographic study area have the potential to cumulatively and adversely impact biological resources, including managed EFH species and threatened and endangered species, when considered in relationship with the Proposed Action. However, these impacts would be short term and localized. Species displaced by construction would rapidly return to disturbed areas, benthic habitat would naturally recover to pre-construction conditions within two years, direct mortality would not have a significant, population-level impact, and the permanent loss of approximately 4.0 acres (175,000 square feet) of benthic habitat would have a negligible impact on the larger Great Bay estuarine system.

The present and reasonably foreseeable in-water projects described in Section 5.4.5.2 include projects that do not overlap with the geographic study area for the Proposed Action, including navigation channel maintenance dredging and expansion of the Portsmouth Harbor turning basin. Each of these projects, if executed, is expected to create only localized disturbance, alteration, and/or loss of marine vegetation and benthic habitat within its respective area of impact. Localized disturbance associated with each project would temporarily disturb the seafloor and increase turbidity; however, heightened turbidity would be localized and is expected to be rapidly ameliorated by local currents and riverine transport. Juvenile and adult fish are expected to avoid areas of disturbance and use nearby habitat for feeding and foraging. Habitat and prey are abundant in the region, and species that would be temporarily displaced by these present and future actions are expected to forage in nearby habitat such as the Great Bay estuary or lower Piscataqua River rather than the lower quality habitat present at the Shipyard. Therefore, turbidity increases and fish displacement resulting from present and future projects that do not overlap with the Project area would not cumulatively and adversely impact biological resources, including managed EFH species and threatened and endangered species, when considered in relationship with the Proposed Action.

Marine Mammals

Present and future projects may result in an increase in anthropogenic sound (both airborne and underwater), increased human presence, increased boat movements, and other associated activities. These actions could result in behavioral impacts on local populations of marine mammals, such as temporary avoidance of habitat, decreased time spent foraging, increased or decreased time spent hauled out (depending on the activity), and other minor behavioral impacts. Most impacts would likely be short term and temporary and unlikely to affect the overall fitness of the animals. Projects should not result in more moderate impacts because no other projects have longer construction timelines (three to five years). Additionally, proposed projects in the harbor, such as the Portsmouth Harbor turning basin expansion, would occur in an area of industrial uses with higher than normal activity and noise levels. Thus, marine mammals in the area may be habituated to these higher levels of ongoing activity and less impacted by ongoing waterfront development.

For projects that overlap with the geographic study area for the Proposed Action, cumulative impacts on marine mammals have the greatest potential to occur during simultaneous pile-driving exposure events. Of greatest concern to marine mammal safety would be the potential for the acoustic injury zones to overlap spatially and temporally. Behavioral disturbance zones from vibratory pile driving have the potential to overlap as a result of concurrent vibratory pile driving that may occur as part of the Sarah Mildred Long Bridge replacement project and the New Hampshire Port Authority Main Wharf expansion project. While these projects do not geographically overlap the Project area, the areas of noise exposure associated with pile driving for the bridge replacement and wharf expansion projects could overlap the ZOI for the Proposed Action at one or more of the Project sites if pile driving occurs concurrently. When two closely located pile-driving projects occur at the same time, noise levels could increase by as much as 3 dB at sites roughly equidistant between the multiple pile-driving rigs. However, because topographic features along the Piscataqua River constrain the geographical extent of the marine mammal behavioral zone, the area affected by vibratory pile driving would not increase cumulatively. Any behavioral impacts would be temporary. With BMPs and mitigation in place (i.e., visual surveillance and the use of shutdown zones), cumulative impacts would not significantly affect marine mammal populations. Nevertheless, the Proposed Action and other future actions would contribute incrementally to cumulative marine mammal disturbance impacts in the Piscataqua River overall. The Navy's continued adherence to the requirements of the Endangered Species Act and Marine Mammal Protection Act would limit disturbance to marine mammals and ensure that important habitats do not become degraded. Furthermore, existing regulatory mechanisms and mitigation measures would protect marine mammals (see Chapter 3) and further decrease the likelihood of potential cumulative impacts on these species.

Indirect impacts on marine mammals may occur as a result of impacts on their prey base (fish) during construction as a result of habitat disturbance during construction. Impacts during construction are expected to be temporary, and the reduction in forage fish habitat would be minimal compared with the total habitat available in the Piscataqua River. Therefore, any reduction in forage fish populations would not be expected to have an adverse impact on marine mammals or their overall fitness.

Because marine mammals are highly mobile, the noise impacts of the Proposed Action could be cumulative with underwater and airborne noise impacts on marine mammals from other non-geographically overlapping activities in the region. However, because the expected impacts of the Proposed Action on marine mammals in general would be temporary, cumulative impacts on marine mammals would be minor.

5.4.6 Visual Resources

5.4.6.1 Description of Geographic Study Area

The ROI assessed for cumulative impacts on visual resources includes the Shipyard and those areas along the New Hampshire and Maine shorelines that provide views of the Shipyard. Each of the Navy and non-Navy projects described in Section 5.3 may result in cumulative impacts with the Proposed Action, except for the Portsmouth Harbor turning basin expansion, Sarah Mildred Long Bridge replacement, and New Hampshire Port Authority Main Wharf Expansion projects; these projects are not in the vicinity of the Shipyard and do not provide views of the Project area.

5.4.6.2 Relevant Past, Present, and Future Actions

The past, present, and reasonably foreseeable Navy projects identified in Section 5.3 may contribute to cumulative changes in the visual character of the Shipyard. The recent Memorial Bridge replacement also may contribute to cumulative impacts on visual resources.

The remaining non-Navy projects identified in Section 5.3 would not contribute to cumulative changes in the visual setting of the Shipyard. The locations of these projects provide no or limited views of the Shipyard and the Project area. While the Sarah Mildred Long Bridge replacement and New Hampshire Port Authority Main Wharf expansion would result in visual changes at their project locations, cumulative impacts on visual resources with the Proposed Action are not likely because the Project area for the Proposed Action would seldom be in the same view as the Sarah Mildred Long Bridge or the New Hampshire Port Authority Main Wharf. Maintenance dredging of the federal navigation channel and expansion of the Portsmouth Harbor turning basin would not result in cumulative visual impacts because of these projects' distance from the Project area and because they would not result in long-term visual changes at their respective locations.

5.4.6.3 Cumulative Impact Analysis

The Shipyard has been subject to numerous changes in its appearance and composition due to the construction, modification, and demolition of various structures. Recent visual changes have resulted from the replacement, repair, and construction of features at Dry Dock 1; building renovations, upgrades, and structural modernizations at Buildings 178 and 55; and improvements and additions to Building 174. These changes have affected the appearance of the Shipyard in and near the Project area for the Proposed Action within views from surrounding areas outside the Shipyard.

Five present or reasonably foreseeable Navy projects may contribute to temporary and permanent, cumulative changes to the visual setting associated with the Shipyard when considered in conjunction with the Proposed Action. They include the Bridge 1 structural repairs; Dry Dock 3 pump well repairs; the consolidation of structural shops, including construction of an addition to Building 92, the waterfront utilities improvement project, and the Dry Dock 1 reactor servicing complex. Temporary visual changes would result primarily from the presence of construction equipment and activities that would be visible in views of the Shipyard and the Project area; however, these impacts would be temporary and would be most noticeable at times when construction overlaps.

Long-term visual changes would result from construction of a new superstructure of different design for Bridge 1 and construction of an addition to Building 92, as well as the addition of above-ground utility improvements associated with the waterfront utilities improvement project and the Dry Dock 1 reactor servicing complex. These changes may affect the overall appearance of the Shipyard as seen from scenic

areas at and surrounding the installation. The pump well at Dry Dock 3 is not visible from other areas within or outside of the Shipyard, so replacing the pump well would not contribute to long-term cumulative changes in the visual setting.

Replacement of Memorial Bridge resulted in long-term visual changes in the bridge and surrounding views, including views of the Shipyard and the Project area. The design of the new bridge was carefully considered to minimize changes in its appearance. The new Memorial Bridge was constructed at the site of the old bridge and incorporates similar design and materials, thereby minimizing visual impacts. While the visual changes associated with this project and the Proposed Action would result in long-term impacts on visual resources in the ROI, these impacts are expected to be minor.

Cumulative visual impacts from past, present, and future actions within the ROI would be less than significant because the new structures and infrastructure constructed by many of these projects would be consistent in appearance with existing buildings and infrastructure in the area and consistent with the overall character of the ROI, which includes a constantly changing industrial Shipyard and commercial port. Many of the visual impacts would result from the presence of construction equipment and would be temporary and minor. Long-term impacts are anticipated to be minor as the cumulative visual changes would be consistent with the Shipyard's industrial setting and many adaptations to allow continued operations. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects would not result in significant impacts within the ROI.

5.4.7 Noise

5.4.7.1 Description of Geographic Study Area

The ROI for cumulative noise impacts is a 0.5-mile radius from the Proposed Action components. Existing noise-sensitive uses within this area include areas of low-density residential and commercial/recreational development and land uses.

5.4.7.2 Relevant Past, Present, and Future Actions

The construction projects listed in Section 5.3.2.1 and 5.3.2.2 would result in temporary increases in ambient noise levels at nearby sensitive receptors. Past actions would not have impacts on noise with the Proposed Action; however, present and reasonably foreseeable projects that could overlap in time and geographic location with the Proposed Action would result in an increase in ambient noise levels that may contribute to cumulative impacts at the closest sensitive receptors. Present and reasonably foreseeable projects within the ROI that could result in a cumulative impact include the Bridge 1 structural repairs and Dry Dock 3 pump well repairs.

5.4.7.3 Cumulative Impact Analysis

Potential cumulative impacts on ambient noise would result from simultaneous operation of equipment at construction sites and an increase in vehicle traffic along routes that would be used during implementation of the Proposed Action. The proposed Bridge 1 structural repairs and Dry Dock 3 pump well repairs would occur within a 0.5-mile radius of, and would overlap in timeframe with, the proposed Berth 11 structural repairs and Dry Dock 3 caisson replacement. In addition, potential temporary cumulative impacts on local traffic would result in intermittent increases in traffic noise at sensitive receptors located near the transportation routes used for the Proposed Action.

Concurrent construction of the Berth 11 structural repairs and Dry Dock 3 caisson replacement, the Bridge 1 structural repairs, and Dry Dock 3 pump well repairs would result in a moderate increase in ambient noise levels at residential receptors located within 1,500 feet of Dry Dock 3 and Berth 11. Assuming that the Bridge 1 structural repairs and Dry Dock 3 pump well repairs would result in similar construction noise levels as those predicted for in-water projects under the Proposed Action, the estimated worst-case composite noise from concurrent activities would be 80 to 83 dBA DNL at 50 feet[4], with a potential increase of 2 to 5 dBA over the existing ambient noise levels at the closest residential receptors located in the Town of Kittery and on Badger's Island. Noise impacts from concurrent construction activities and heavy-duty truck traffic would be temporary, intermittent, and localized during daytime hours.

Therefore, implementation of the Proposed Action combined with the Bridge 1 structural repairs and Dry Dock 3 pump well repairs would result in moderate, temporary cumulative impacts on ambient noise within the ROI.

5.4.8 Infrastructure

5.4.8.1 Description of Geographic Study Area

The ROI for potential impacts on utility infrastructure includes the Shipyard. The Proposed Action would not result in an increase in demand for utility services. Therefore, the Proposed Action would not impact regional utility infrastructure or services, and no cumulative impacts with the other projects identified in Section 5.3 would result.

The ROI for potential impacts on solid waste management includes the Shipyard and the federal navigation channel in the Piscataqua River.

5.4.8.2 Relevant Past, Present, and Future Actions

The recently completed project to construct a consolidated waterfront support facility at the Shipyard, the Buildings 178 and 55 energy and structural repairs project, and the consolidation of structural shops could potentially result in cumulative impacts on infrastructure with the Proposed Action. The other identified past, present, and reasonably foreseeable projects at the Shipyard would not result in any changes in operations at the Shipyard that would change the installation's utility use, and any utility work involved in these projects would be localized at the project sites. Therefore, no cumulative impacts with the Proposed Action and these projects would result.

The Navy and non-Navy construction projects identified in Section 5.3 would result in cumulative impacts on solid waste management. The federal navigation channel maintenance dredging and expansion of the Portsmouth Harbor turning basin would result in cumulative impacts with the Proposed Action because each of these projects would generate dredge spoils that would require disposal.

[4] Composite noise is calculated as a logarithmic function. When two noise sources have decibel values that differ by 0 to 1 dB and are located at the same distance from a receptor, the composite noise is determined by adding 3 dB to the higher value. For the purposes of this analysis, it has been assumed that the Bridge 1 structural repairs project would add 3 dB to the construction noise levels predicted for the proposed Dry Dock 3 caisson replacement.

5.4.8.3 Cumulative Impact Analysis

Recently completed construction projects at the Shipyard, including the Buildings 178 and 55 energy and structural repairs and construction of the waterfront support facility at Dry Dock 3, resulted in changes to the Shipyard's utility infrastructure at the project locations and generated a short-term increase in construction and demolition (C&D) debris during the construction period. Utility work was contained within the immediate project sites and is completed; therefore, no cumulative impacts with the Proposed Action on the Shipyard's utility infrastructure would result. Neither one of these projects resulted in increases in the number of Shipyard personnel or substantial changes to Shipyard operations; therefore, no long-term increases in utility demand resulted. The energy and structural repairs at Buildings 178 and 55 may result in a long-term decrease in the amount of electrical power used at the Shipyard as a result of measures to improve building energy efficiencies and incorporate renewable energy technology sufficient to obtain Leadership in Energy and Environmental Design Silver certification (Navy, 2010; Navy, 2011).

Neither of the two recently completed construction projects resulted in long-term impacts on stormwater management. Site hydrology in most cases was not altered by these projects. The work at Building 55 improved site hydrology by removing areas of impervious surface. The Proposed Action likewise would not result in changes in site hydrology at any of the project sites, which are currently paved. Therefore, no cumulative impacts on stormwater management would result. Each of these projects was or would be exempt from the requirements of the Energy Independence and Security Act and the Navy's Low-Impact Development policy.

Potential impacts on infrastructure as a result of the planned projects to consolidate structural shops and paint, blast, and rubber facilities and the project to construct a Dry Dock 1 reactor servicing complex on the Shipyard will be assessed in the EA or CATEX for each project. It is expected that these impacts would be short term and negligible or minor, similar to the Shipyard projects discussed above, and would not result in significant cumulative impacts with the Proposed Action. While the proposed waterfront utilities improvements project likewise would result in temporary impacts during construction, completion of this project is expected to improve utility service to various waterfront facilities at the Shipyard. None of these planned projects would result in changes in personnel loading or operations at the Shipyard that would result in substantial changes in utility demand.

Past, present, and reasonably foreseeable construction projects on the Shipyard have or would generate C&D debris requiring recycling or disposal at approved facilities. In addition, dredging projects in the Piscataqua River would result in dredge spoils that would need to be disposed of at authorized disposal sites. Navy construction contractors are required to comply with Navy requirements for solid waste management that conform to applicable federal, state, and local regulations intended to protect the environment through management of solid waste. The requirements address work practices that would be implemented to ensure that the amount of solid waste generated is minimized and is recycled to the extent practicable, and any that cannot be salvaged or recycled is disposed of in an environmentally responsible manner at permitted and approved C&D debris landfills. Multiple authorized landfills are available to accept C&D debris generated by Shipyard construction projects; therefore, significant cumulative impacts are not expected to result.

Dredge spoils removed from the site of the federal navigation channel turning basin expansion, including approximately 19,659,000 cubic feet (728,100 cubic yards) of sediments and 683,100 cubic feet (25,300 cubic yards) of rock, would be disposed of at the Isles of Shoals North ocean placement site,

located approximately 10 miles offshore of the mouth of the river, or reused for shoreline stabilization projects along the coasts of Maine and Massachusetts (Bostick, 2015). Maintenance dredging of the Simplex Shoals reach of the federal navigation channel would result in removal of up to 1,350,000 cubic feet (50,000 cubic yards) of clean sand and gravel during each recurring dredging operation. This material is disposed of at an authorized disposal site in the Piscataqua River (USACE, 2012). Dredge spoils removed during the Berths 11, 12, and 13 structural repairs under either Alternatives 1 or 2 and found to be contaminated would be disposed of at an authorized landfill in accordance with the requirements of the Maine Solid Waste Management rules and regulations. Dredge spoils resulting from the Dry Dock 3 caisson replacement project under Alternative 2 would be disposed of at an upland facility. Because of the different disposal sites that would be used and measures taken to reduce the amount of dredged material requiring disposal, the federal navigation channel dredging projects would not result in cumulative impacts on solid waste management with the Proposed Action.

Therefore, the other Navy and non-Navy projects identified above are not expected to result in significant cumulative impacts with the Proposed Action on infrastructure.

5.4.9 Transportation

5.4.9.1 Description of Geographic Study Area

The geographic area considered for cumulative impacts on transportation includes the three major roadways that run north-south between Maine and New Hampshire—I-95, U.S. Route 1, and the U.S. Route 1 Bypass—and local roads that travel between these major roadways and the Shipyard. Access to the Shipyard is provided by S.R. 103 (Walker Street) and Wyman Avenue.

5.4.9.2 Relevant Past, Present, and Future Actions

Past, present, and reasonably foreseeable transportation projects that affect the flow of traffic in the vicinity of and into the Shipyard may contribute to cumulative impacts on the operation of the transportation network during implementation of the Proposed Action.

The Memorial Bridge carrying U.S. Route 1 over the Piscataqua River was replaced between 2012 and 2013, and the Sarah Mildred Long Bridge carrying the U.S. Route 1 Bypass is currently being replaced, with completion expected in late 2017. Traffic on Memorial Bridge is expected to increase during the closure of the Sarah Mildred Long Bridge.

Bridge 1, the primary vehicular, bicycle, and pedestrian bridge and sole railway bridge providing access to Seavey's Island, is undergoing structural repairs that began in FY 2015 and will be completed prior to start of construction for the Project.

5.4.9.3 Cumulative Impact Analysis

The Proposed Action would result in a minor increase in traffic on roads in the study area during construction. During the period when the U.S. Route 1 Bypass is closed at the Sarah Mildred Long Bridge, construction traffic may contribute to cumulative traffic impacts on Memorial Bridge and U.S. Route 1. However, as shown in Tables 4.9-2 and 4.9-3, the volume of trips that would be generated as a result of implementation of the project represents only a small amount of the AADT of Memorial Bridge/U.S. Route 1 and Interstate 95. Most construction traffic coming from the south would be expected to use I-95 to cross the river into Maine and thereby avoid the narrow local roadways through

Portsmouth; therefore, cumulative traffic impacts on the Memorial Bridge and on U.S. Route 1 during construction are expected to be minor.

Multiple construction projects are regularly ongoing at the Shipyard, and the traffic generated by any concurrent Navy projects would not be expected to create a noticeable increase in the traffic to and from Seavey's Island. It is not unusual for construction traffic to enter the Shipyard via Bridge 2 because heavy and oversize trucks were being diverted to Bridge 2 due to structural limitations of Bridge 1 even before the repairs to Bridge 1 began. Cumulative transportation impacts caused by the addition of construction traffic generated by the Proposed Action could result in short-term, minor impacts on traffic in the vicinity of the Shipyard during peak traffic periods. This cumulative impact could be lessened by encouraging or requiring some construction traffic to enter and exit the Shipyard during off-peak hours to mitigate impacts as needed. The Proposed Action would not result in any change in local or regional transportation networks after construction and would not affect traffic traveling to and from the Shipyard over the long term. Therefore, the Proposed Action would not result in long-term cumulative impacts to transportation.

5.4.10 Hazardous Materials and Wastes

Cumulative impacts associated with hazardous materials and wastes were not analyzed in detail for this EA. The Proposed Action would result in only negligible impacts from the handling of hazardous materials, the generation and management of hazardous waste, and the handling of materials with special hazards. The Navy and contractors would comply with a framework of federal/state regulations and Navy procedures for handling such materials and wastes. Accordingly, cumulative impacts associated with hazardous materials and wastes from past, present, and future actions within the ROI are not expected.

6 Other Considerations Required by NEPA

6.1 Consistency with other Federal, State, and Local Laws, Plans, Policies, and Regulations

In accordance with 40 Code of Federal Regulations (CFR) section 1502.16(c), analysis of environmental consequences shall include discussion of possible conflicts between the Proposed Action and the objectives of federal, regional, state, and local land use plans, policies, and controls. Table 6.1-1 identifies the principal federal and state laws and regulations that are applicable to the Proposed Action and describes briefly how compliance with these laws and regulations would be accomplished.

Table 6.1-1 Principal Federal and State Laws Applicable to the Proposed Action

Federal and State Laws	*Regulatory Authority*	*Status of Compliance*	*Section of the EA*
National Environmental Policy Act (NEPA) (42 U.S.C. section 4321 et seq.); Council on Environmental Quality (CEQ) NEPA implementing regulations (40 CFR parts 1500-1508; Navy procedures for Implementing NEPA (32 CFR part 775 and OPNAVINST 5090.1D)	Navy	This Environmental Assessment (EA) has been prepared in accordance with NEPA, CEQ regulations implementing NEPA, and Navy NEPA procedures. Public participation and review are being conducted in compliance with NEPA.	Entire EA
Clean Air Act (CAA) (42 U.S.C. section 7401 et seq.)	U.S. Environmental Protection Agency (USEPA)	The air quality analysis in the EA concludes that proposed emissions would not create a major regional source of air pollutants or affect the current attainment status, and would comply with all applicable state and regional air agency rules and regulations.	3.1 and 4.1, Air Quality
Clean Water Act (CWA) (33 U.S.C. Section 1251 et seq.)	USEPA, U.S. Army Corps of Engineers (USACE) Maine Department of Environmental Protection (MEDEP)	The EA considers impacts on water quality. The Navy is applying for both a Category II USACE general permit and an individual USACE permit under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act. In accordance with permit requirements, the Navy will pay an in-lieu fee to the Maine DEP in compensation for the loss of wetland functions and values resulting from the proposed temporary and permanent fill.	3.2 and 4.2, Water Resources; 3.8 and 4.8, Infrastructure

Table 6.1-1 Principal Federal and State Laws Applicable to the Proposed Action

Federal and State Laws	*Regulatory Authority*	*Status of Compliance*	*Section of the EA*
Rivers and Harbors Act (33 U.S.C. Section 403 et seq.)	USEPA, U.S. Army Corps of Engineers (USACE)	The EA addresses proposed fill in the Piscataqua River. The Navy is applying for both a Category II USACE general permit and an individual USACE permit under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act.	3.2 and 4.2, Water Resources
Coastal Zone Management Act (CZMA) (16 U.S.C. section 1451 et seq.)	National Oceanic and Atmospheric Administration (NOAA)	The coastal consistency determination for the Proposed Action considers impacts to land uses, water uses, and natural resources of the coastal zone.	Appendix B [NOTE: Appendix will be included when consultation is complete.]
National Historic Preservation Act (NHPA) (54 U.S.C. Section 306108 et seq.)	Advisory Council on Historic Preservation (ACHP) Maine Historic Preservation Commission	This EA considers impacts on cultural resources. The Navy is consulting with the Maine State Historic Preservation Officer and other interested parties pursuant to Section 106 of the NHPA.	3.4 and 4.4, Cultural Resources Appendix D [NOTE: Appendix will be included when consultation is complete.]
Endangered Species Act (ESA) (16 U.S.C. section 1531 et seq.)	U.S. Fish and Wildlife Service (USFWS) National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NOAA Fisheries)	This EA considers impacts on species listed as threatened or endangered pursuant to this act. The Navy is consulting with the USFWS and NOAA Fisheries pursuant to section 7 of the ESA.	3.5 and 4.5, Biological Resources Appendix H [NOTE: Appendix will be included when consultation is complete.]
Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (16 U.S.C. Section 1801 et seq.)	NOAA Fisheries	The EA considers impacts on fish and essential fish habitat. Pursuant to this act, the Navy is consulting with NOAA Fisheries regarding potential adverse impacts on essential fish habitat.	3.5 and 4.5, Biological Resources Appendix G [NOTE: Appendix will be included when consultation is complete.]
Marine Mammal Protection Act (16 U.S.C. section 1361 et seq.)	NOAA Fisheries	The EA considers impacts to protected marine mammal species pursuant to this act. The Navy is applying for phased Incidental Harassment Authorizations to cover each year of the proposed in-water work.	3.5 and 4.5, Biological Resources Appendix F
Bald and Golden Eagle Protection Act (16 U.S.C. section 668-668d)	USFWS	The EA considers potential impacts on eagles protected under this act.	Chapter 3 introduction

Table 6.1-1 Principal Federal and State Laws Applicable to the Proposed Action

Federal and State Laws	*Regulatory Authority*	*Status of Compliance*	*Section of the EA*
Executive Order 11988, Floodplain Management	Navy	The EA considers potential impacts on floodplains and floodplain management.	3.2 and 4.2, Water Resources
Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations	Navy	The EA considers the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations.	Chapter 3 introduction
EO 13045, Environmental Health Risks and Safety Risks to Children	Navy	The EA considers the potential for disproportionate effects on children.	Chapter 3 introduction
EO 13175, Consultation and Coordination with Indian Tribal Governments	Navy	The EA considers potential impacts on traditional cultural properties. The Navy is consulting with federally recognized tribes pursuant to this EO.	3.4 and 4.4, Cultural Resources Appendix E [NOTE: Appendix will be included when consultation is complete.]
EO 13693, Planning for Federal Sustainability in the Next Decade	Navy	The EA considers greenhouse gas emissions resulting from the Proposed Action.	3.1 and 4.1, Air Quality
Maine Natural Resources Protection Act (38 Maine Revised Statutes [M.R.S.] sections 480-A to 480-BB)	MEDEP	The EA considers impacts on the Piscataqua River. The Navy is applying for a Natural Resources Protection Act individual permit from MEDEP for the Proposed Action. In accordance with permit requirements, the Navy will pay an in-lieu fee to the Maine DEP in compensation for the loss of wetland functions and values resulting from the proposed temporary and permanent fill.	3.2 and 4.2, Water Resources
Maine Site Location of Development Act (38 M.R.S. Section 481)	MEDEP	The EA considers impacts on resources protected under the Maine Site Location of Development Act and permitting requirements.	3.2 and 4.2, Water Resources
Maine Stormwater Management Law (38 M.R.S. Section 420-D)	MEDEP	The EA considers compliance requirements under the Maine Stormwater Management Law.	3.2 and 4.2, Water Resources
Maine Erosion and Sedimentation Control Law (38 M.R.S. Section 420-C)	MEDEP	The EA considers potential impacts on water quality.	3.2 and 4.2, Water Resources

Coastal Zone Management

The federal Coastal Zone Management Act (CZMA) of 1972 establishes a federal-state partnership to provide for the comprehensive management of coastal resources. Coastal states and territories develop site-specific coastal management programs based on enforceable policies and mechanisms to balance resource protection and coastal development needs. The Maine Coastal Program lays out the policy to guide the use, protection, and development of land and ocean resources within the state's coastal zone. Under the act, federal activity in, or affecting, a coastal zone requires preparation of a Coastal Zone Consistency Determination or a Negative Determination. In other words, any federal agency proposing to conduct or support an activity within or outside the coastal zone that will affect any land or water use or natural resource of the coastal zone is required to do so in a manner consistent with the CZMA or applicable state coastal zone program to the maximum extent practicable. However, federal lands, which are "lands the use of which is by law subject solely to the discretion of…the Federal Government, its officers, or agents," are statutorily excluded from the state's "coastal zone." If, however, the proposed federal activity affects coastal resources or uses beyond the boundaries of the federal property (i.e., has spillover effects), the CZMA Section 307 federal consistency requirement applies. As a federal agency, the Navy is required to determine whether its proposed activities would affect the coastal zone. This takes the form of either a Negative Determination or a Consistency Determination.

Potential impacts on applicable resources that are subject to the state's program have been addressed in the respective environmental consequences sections of this document.

6.2 Irreversible or Irretrievable Commitments of Resources

Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of non-renewable resources such as metal and fuel and natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Human labor is also considered an irretrievable resource. Another impact that falls under this category is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

Implementation of the Proposed Action would involve human labor; the consumption of fuel, oil, and lubricants for construction vehicles; and loss of natural resources, including marine sediments and benthic habitat across an area of up to approximately 118,800 square feet (the footprint of the proposed bulkheads at Berths 11, 12, and 13, excluding areas of previous fill below the pier), and immobile benthic organisms or marine vegetation and less mobile benthic invertebrates or fish in in-water areas affected by the berths' structural repairs and Dry Dock 3 caisson replacement. The Proposed Action would result in replacement of the Dry Dock 3 caisson, resulting in irreversible changes to Dry Dock 3, a contributing resource within the National Register of Historic Places (NRHP)-eligible Portsmouth Naval Shipyard Historic District. Implementation of the Proposed Action would not result in significant irreversible or irretrievable commitment of resources.

6.3 Unavoidable Adverse Impacts

This EA has determined that the alternatives considered would not result in any significant impacts. Implementing either action alternative would result in the following unavoidable environmental impacts:

- Temporary and minor increases in emissions of criteria air pollutants during construction. A small increase in direct and indirect emissions from energy use and equipment operations following implementation.
- Short-term, minor impacts on surface water, wetlands, and marine sediments resulting from disturbance and water quality impacts (turbidity) during construction.
- Under Alternative 1 or 2, dredging and fill of between approximately 98,800 square feet and approximately 118,800 square feet (with implementation of Option 1) of the Piscataqua River adjacent to Berths 11, 12, and 13, resulting in permanent removal of marine sediments and benthic habitat, including designated EFH and loss of wetland functions, individual benthic organisms, marine vegetation, and less mobile fish.
- Dredging and temporary fill of approximately 7,458 square feet of the Piscataqua River adjacent to the Dry Dock 3 caisson under Alternative 2, resulting in removal of marine sediments; disruption of benthic habitat; and loss of individual benthic organisms, marine vegetation, and less mobile fish.
- Temporary increases in underwater noise levels above NOAA Fisheries' Level B Disturbance Thresholds for marine mammals protected under the Marine Mammal Protection Act within a 0.48 square mile area in the lower Piscataqua River.
- Temporary increases in underwater noise levels above established criteria for physical injury and behavioral changes in fish. Pathological or physiological impacts on fish are expected to be localized; areas in which potential behavioral impacts, including temporary displacement, could occur would extent up to 5 miles from the in-water construction areas.
- Temporary, moderate increases in ambient airborne noise levels at the nearest sensitive receptors during construction.

6.4 Relationship between Short-term Use of the Environment and Long-term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development site reduces future flexibility in pursuing other options, or that using a parcel of land or other resources often eliminates the possibility of other uses at that site.

In the short term, construction of the waterfront improvement projects would result in temporary impacts on air quality, surface water quality, soils, and estuarine biological resources. The Proposed Action also would result in short-term impacts on human communities near the Project area resulting from construction noise and traffic. Construction of the waterfront improvement projects would result in the long-term impacts noted in Sections 6.2 and 6.3 but would not significantly impact the long-term natural resource productivity of the Project area or the lower Piscataqua River estuary. The Proposed Action would not result in any impacts that would significantly reduce environmental productivity or permanently narrow the range of beneficial uses of the environment.

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Appendix A
General Construction Methods for in-Water Projects

A.1 Alternative 1, Preferred Alternative

A.1.1 Berths 11, 12, and 13 Structural Repairs

This proposed project would protect the pier structure at Berths 11, 12, and 13 from further deterioration and restore the portal crane load-bearing capacity at these berths by enclosing the berths with king pile and concrete shutter panel bulkheads. Construction of this project would be phased to avoid causing operational impacts at Dry Docks 1 and 3. Phase 1 of construction at Berth 11 would begin no earlier than October 2016 (in-water work would begin no earlier than January 2017) and would be completed by June 2019. Phase 2 of construction at Berths 12 and 13 would begin no earlier than October 2020 (in-water work to be determined based on availability of berths) and be completed by October 2022. Construction schedules are subject to change due to mission requirements.

Bulkhead	A nautical term for a wall, usually referring to a wall in the hull of a ship.
King Piles	Steel piles with an H-shaped cross-section that are driven vertically at regular intervals along the length of the planned bulkhead. King piles interlocked with steel sheet-piles increase the strength of a bulkhead.
Concrete Shutter Panels	Pre-cast concrete panels that would serve a similar function to steel sheet-piles.
Steel Sheet-Piles	Sheets of steel with interlocking edges that are installed vertically to create a wall, usually to retain or hold back soil.
Sister Piles	Piles that would be driven beside existing piles and secured to the in-board portal crane rail beam to provide additional support for the rail beam.
Spud Piles	Round or H-type piles used to frame and/or brace sheet piles.

At the beginning of the construction process during both phases, sections of concrete and timber decking would be stripped in the construction areas, as required. Concrete and utility lines would be removed, and utility lines would be relocated as needed. Construction and demolition debris would be transported off the Shipyard for recycling or disposal at an approved landfill facility. While the pier deck is open, existing piles that are significantly corroded would be repaired.

Under Phase 1, the existing timber rub strips, fenders, and their support piles would be removed from Berths 11A and 11B. Timber fender piles would only need to be removed from Berth 11A; none are located at Berth 11B. Two timber “dolphins (i.e., a structure constructed of one or several piles and used to moor vessels)” at the western corners of the pier also would be removed at the beginning of in-water construction and replaced with the same number of timber piles once the bulkhead has been constructed. Table A-1 provides the numbers of timber fender piles that would be removed at Berth 11A and the numbers of piles making up the two dolphins.

A bulkhead (approximately 867 feet long) would be constructed around Berths 11A and 11B. The bulkhead at Berth 11 would be closed off and connected (via a “return” bulkhead) to the outer structure

of Dry Dock 1 near Berth 11A and to the existing bulkhead beneath the pier between Berths 11B and 11C.

Table A-1 Numbers of Piles under Alternative 1, King Pile and Concrete Shutter Panel Bulkhead[1]

Berth	*Alternative 1*			*Alternative 1 (with Option 1)*		
	11	*12*	*13*	*11*	*12*	*13*
Piles Installed						
King Piles (Rock-socketed)	60	16	67	94	16	67
Sheet Piles (Vibratory Driven)	69	0	0	69	0	0
Sheet Pile Returns (Vibratory Driven)	43	86[2]	43	43	43[3]	43
Sister Piles (Impact Driven)	50	0	37	50	0	37
Timber-pile Dolphins (Vibratory Driven)[4]	7	0	13	7	0	13
Piles Removed						
Timber Piles (Vibratory Extraction)[5]	70	37	66	70	37	66
Timber-pile Dolphins (Vibratory Extraction)	7	0	13	7	0	13

Source: MN-FST 2015b

Notes:

1 Pile numbers are approximate.

2 Up to approximately 86 sheet piles may be required for the returns at Berth 12 if construction of the bulkheads at Berths 12 and 13 does not occur simultaneously. Approximately half this number of piles (43 piles) would be required to construct a return at the southern end of Berth 12, where this berth meets Berth 11.

3 Up to approximately 43 sheet piles would be required to construct a return at the northern end of Berth 12 if construction of the bulkheads at Berths 12 and 13 does not occur simultaneously.

4 The timber-pile dolphins are located at the corners of Berths 11 and 12 and Berths 12 and 13.

5 Timber piles would be removed from Berths 11A, 12, and 13A only. No timber piles are located at Berths 11B, 11C, or 13B.

Under Phase 2, the existing timber fenders and their timber support piles would be removed, and the bulkhead would be constructed around Berth 12 (approximately 235 feet) and Berth 13 (A and B) (approximately 770 feet) from the southwestern corner of the pier to the edge of Dry Dock 3. The bulkhead would be closed off and connected to the existing bulkhead beneath the pier at the southern end of Berth 12 and to the outer sill structure of Dry Dock 3 at the eastern end of Berth 13A. A return would be constructed at the eastern end of Berth 13A between the new bulkhead and existing bulkhead. A return to the existing bulkhead beneath the pier also would be constructed at the northern end of Berth 12 to enclose that section of the bulkhead because the bulkheads at Berths 12 and 13 (A and B) likely would not be constructed simultaneously (see Figure 2-1).

At the start of in-water construction, a level trench would be dredged along the footprint of the bulkhead using a mechanical dredge and filled with a granular material to provide a seat for the

concrete shutter panels. During Phase 2, a layer of stone riprap, totaling approximately 2,970 cubic feet, adjacent to Berth 12 also would be dredged. The dredged trench and the bottoms of the panels would be slightly lower than the permitted berth dredge depth to prevent the bottom of the bulkhead from being undermined during future maintenance dredging. At locations where a bedrock layer occurs above the permitted dredge depth, the panels would be installed slightly above the bedrock (MN-FST 2015b).

Next, king piles would be regularly spaced along the berths and grouted into sockets drilled into the bedrock (i.e., "rock-socketed"). The drill rig would be operated from a trestle structure or jack-up barge (approximately 70 feet long) to avoid interfering with portal crane operations at the berth during construction. The socket drill would operate within a casing that would contain sediments disturbed during drilling. Sediment and drill spoils captured during drilling would be disposed of at an approved landfill facility off of the Shipyard. Table A-1 provides the approximate number of piles that would be installed at each berth. The concrete shutter panels would be installed in stacks between the king piles (MN-FST 2015b).

Along an approximately 16-foot section at the eastern end of Berth 11A and an approximately 100-foot section along Berths 11B and 11C, the depth to bedrock is greater, thus allowing a conventional sheet-pile bulkhead to be constructed (MN-FST 2015b). The construction process would be the same as described for the sheet-pile installation under Alternative 2 (see Section A.2). The steel sheet-piles would be driven to bedrock using a vibratory hammer.

Additional in-water work would be required to install steel H-type sister piles at the location of the inboard portal crane rail beam at Berths 11 and 13, including Berth 11C. The sister piles would provide additional support to the portal crane rail system and restore its load-bearing capacity. The sister piles would be driven into the bedrock below the pier using an impact hammer. The area below the pier is open at this location, and the sister piles would be driven into water generally less than 10 feet deep. The sister piles may be installed before the bulkhead is constructed at each berth, depending upon boat schedules at the berths. The inboard portal crane rail beam is shown on Figure 2-2.

Most of the sediment dredged from the river under Alternative 1 (approximately 94 percent) would be stockpiled on a barge and saved for use as fill material behind the new bulkhead (MN-FST 2015b). Once the bulkhead is connected to the pier at both ends and closed off, the area inside the bulkhead and beneath the pier would be backfilled. Fill material would be laid down inside of the bulkhead to an elevation within approximately 1 foot of the mean high water mark. Pea stone (which does not need to be compacted) would be used to fill the space from the bottom of the bulkhead to approximately mean low water (MLW). The pea stone would be covered with filter fabric and topped with an approximately 5-foot layer of granular fill that would only need to be loosely compacted. Dredged sediments that are suitable for reuse would likely be incorporated into the granular fill, which could be placed between tide cycles, in the dry.

Backfilling the fitting-out pier at Berths 11, 12, and 13 would have several benefits:

- Slowing down the rate at which the support piles are corroded by creating a reduced oxygen environment
- Protecting the piles from water action and the splash zone
- Laterally supporting the piles along most of their height (MN-FST 2015).

The bulkhead would not be dewatered before compaction, but geotextile fabric would be placed against the interior of the bulkhead to catch most debris or silt forced with water through seams in the bulkhead during compaction. In addition, a temporary silt curtain and boom would be installed outside of the bulkhead, approximately 18 feet off Berths 11 and 13, during the backfill process to catch debris or silt that escapes the bulkhead. Water inside of the silt curtain would be cleaned of debris and silt as needed.

The total amount of fill that would be needed under Phases 1 and 2 of Alternative 1 would be approximately 1,142,000 cubic feet (42,000 cubic yards), as shown in Table A-2. An area of approximately 98,800 square feet would be filled. Use of the dredged sediment as fill material would reduce the amount of fill material that would need to be brought onto the Shipyard under Alternative 1 to approximately 1,027,000 cubic feet (38,000 cubic yards), or 90 percent of the total amount of fill. Once the bulkhead is backfilled, the granular material at the base of the concrete shutter panels would be grouted to impede water flow beneath the bulkhead (MN-FST 2015b).

Table A-2 Volume of Dredged Sediments and Fill Material at Berths 11, 12, and 13 under Alternative 1 (Including Option 1)

Phase	*Berth*	*Dredged Material Requiring Off-site Disposal in ft^3 (cy)*	*Dredged Material for Reuse as Fill Material in ft^3 (cy)*	*Total Fill Material in ft^3 (cy)*
1	11A	30,510 (1,130)	91,800 (3,400)	270,000 (10,000)
	11B	0 (0)	54,000 (2,000)	287,550 (10,650)
1	**Total**	**30,510 (1,130)**	**97,200 (5,400)**	**557,550 (20,650)**
1, Option 1	11C	0 (0)	30,240 (1,120)	263,250 (9,750)
	Total	**30,510 (1,130)**	**127,440 (6,520)**	**820,800 (30,400)**
2	12	2,970 (110)	0 (0)	98,010 (3,630)
	13A	0 (0)	11,340 (420)	110,700 (4,100)
	13B	0 (0)	5,940(220)	375,300 (13,900)
	Total	**2,970 (110)**	**17,280 (640)**	**584,010 (21,630)**
Total, without Option 1				**1,141,560 (42,280)**
Total, with Option 1				**1,404,810 (52,030)**

Note: The exact means and methods for construction are at the discretion of the construction contractor. All volumes are approximate.

Rock anchors would be installed in the bulkhead to provide lateral support (see Figure 2-2). The rock anchors would be drilled into the bedrock under the pier from the upper part of the water side of the bulkhead. The rock anchors, spaced at approximately 12.5 feet on center, would laterally support the bulkheads.

Once the sister piles have been installed and the fill material has been placed, the existing concrete jackets installed around the pier support piles during earlier repair work would be repaired along their uppermost 8 feet (which would remain above the fill material); concrete removed from the pier deck during construction would be restored and timber decking would be installed to span the gap between the existing timber deck and the bulkhead (MN-FST 2015b). The existing timber fender system at each berth would be replaced with polyethylene rub strips on the new bulkhead.

The king pile and concrete shutter panel bulkhead proposed under Alternative 1, once complete, would enclose and laterally support the piles; protect the pier's utility systems; prevent additional corrosion of the piles and thereby eliminate the expensive, accelerated maintenance cycle; and restore the portal crane rail system's load-bearing capacity.

Option 1, Installation of Bulkhead at Berth 11C

The bulkhead installed at Berth 11C if Option 1 is implemented would extend from the western end of Berth 11B to the southern end of Berth 12. The total length of the bulkhead at Berths 11A, 11B, and 11C would be approximately 1,267 feet (see Figure 2-3). The in-water construction process would be the same as the process described above.

If Option 1 is implemented, the Navy would still install sister piles at the inboard rail beam as described above. Table A-1 provides the approximate number of piles that would be installed at Berths 11, 12, and 13 under Alternative 1 with Option 1. Approximately 1,405,000 cubic feet (52,000 cubic yards) of fill would be needed if Option 1 is implemented, and an area of approximately 118,800 square feet would be filled. The approximate amount of fill needed at each berth is shown in Table A-2.

A.1.2 Dry Dock 3 Caisson Replacement

The Navy is proposing to replace the caisson at Dry Dock 3 to address the deterioration of the existing caisson and meet the requirements of the NAVSEA Safety Certification Program. This project would be completed between February 2017 and August 2018. In-water work would occur at different times over an approximately 12- to 18-month in-water work period, beginning no earlier than March 2017 and ending no later than July 2017. Replacement of the caisson and repair of the inner and outer concrete caisson seats would be scheduled around the operational schedule for Dry Dock 3. (The construction schedule may change depending on mission requirements.) Section 2.3.2 describes in-water work carried out for this project under Alternative 1; no additional in-water work would be required under the preferred alternative.

A.2 Berths 11, 12, and 13 Structural Repairs (Alternative 2)

A.2.1 Berths 11, 12, and 13 Structural Repairs

The overall scope of this project would be the same as described in Section A.1.1. The pier structure at Berths 11, 12, and 13 would be protected from further deterioration, and the portal crane load-bearing capacity would be restored through construction of bulkheads around the berths. Under Alternative 2, the bulkheads would be constructed with king piles and steel sheet-piles. Construction would occur in the same phases noted under Alternative 1. Phase 1 of construction at Berth 11 would begin no earlier than October 2016 (in-water work would begin no earlier than January 2017) and be completed by June 2019. Phase 2 of construction at Berths 12 and 13 would begin no earlier than October 2020 (in-water work to be determined based on availability of berths) and be completed by October 2022.

At the beginning of the construction process during both phases, sections of concrete and timber decking would be stripped in the construction areas, as required. Concrete and utility lines would be removed, and utility lines would be relocated as needed. Construction and demolition debris would be transported off the Shipyard for recycling or disposal at an approved landfill facility. While the pier deck is open, existing piles that are significantly corroded would be repaired.

Under Phase 1, the existing timber rub strips, fenders, and their timber support piles would be removed from Berths 11A and 11B. Timber fender piles would only need to be removed from Berth 11A; none are located at Berth 11B. The two timber dolphins also would be removed and replaced with the same number of timber piles once the bulkhead has been constructed (see Table A-4).

Table A-4 Numbers of Piles under Alternative 2, King Pile and Sheet Pile Bulkhead[1]

Berth	***Alternative 2***			***Alternative 2 (with Option 1)***		
	11	***12***	***13***	***11***	***12***	***13***
Piles Installed						
King Piles (Rock-socketed)	176	35	160	240	35	160
Sheet Piles (Vibratory Driven)	350	68	318	478	68	318
Sheet-pile Returns (Vibratory Driven)	43	86[2]	43	43	43[3]	43
Sister Piles (Impact Driven)	50	0	37	50	0	37
Timber-pile Dolphins (Vibratory Driven)[5]	7	0	13	7	0	13
Piles Removed						
Timber Piles (Vibratory Extraction)[6]	70	37	66	70	37	66
Timber-pile Dolphins (Vibratory Extraction)	7	0	13	7	0	13

Notes:

1 Pile numbers are approximate.

2 Up to approximately 86 sheet piles may be required for the returns at Berth 12 if construction of the bulkheads at Berths 12 and 13 does not occur simultaneously. Approximately half this number of piles (43 piles) would be required to construct a return at the southern end of Berth 12, where this berth meets Berth 11.

3 Up to approximately 43 sheet piles would be required to construct a return at the northern end of Berth 12 if construction of the bulkheads at Berths 12 and 13 does not occur simultaneously.

5 The timber-pile dolphins are located at the corners of Berths 11 and 12 and Berths 12 and 13.

6 Timber piles would be removed from Berths 11A, 12, and 13A only. No timber piles are located at Berths 11B, 11C, or 13B.

A bulkhead (approximately 867 feet long) would be constructed around Berths 11A and 11B (see Figure 2-1). The bulkhead would be placed approximately 5 feet out from the existing face of the pier at Berths 11A and 11B (except along the eastern 425 feet of Berth 11A, which would be offset nearly 14.5 feet from the existing berth face, as described in Section 2.3.2) to provide room for the sheet piles to be driven and the king piles to be rock-socketed. The bulkhead at Berth 11 would be closed off and connected via a return to the outer sill structure of Dry Dock 1 near the eastern end of Berth 11A and to the existing bulkhead beneath the pier between Berths 11B and 11C.

Under Phase 2, the existing timber fenders and their support piles (see Photo A-1) would be removed at Berths 12 and 13 (A and B), and a bulkhead would be constructed around Berth 12 (approximately 235 feet long) and Berth 13 (A and B) (approximately 770 feet long) from the southwestern corner of the pier to the edge of Dry Dock 3. The bulkhead would be closed off and connected to the existing bulkhead beneath the pier at the southern end of Berth 12 and to the outer sill structure of Dry Dock 3 at the eastern end of Berth 13A. A return would be constructed at the eastern end of Berth 13A between the new bulkhead and the existing bulkhead. A return to the existing bulkhead beneath the

pier also would be constructed at the northern end of Berth 12 because the bulkheads at Berths 12 and 13 (A and B) likely would not be constructed simultaneously (see Figure 2-1).

Photo A-1 Timber Piles and Fender System

Dredging would not be required under Alternative 2 along most of the bulkhead footprint, with the exception of the layer of stone riprap (approximately 2,970 cubic feet) adjacent to Berth 12 that would be dredged at the beginning of Phase 2. During the in-water construction under both phases, king piles would be regularly spaced along the piers and rock-socketed into the bedrock. Rock-socketing under Alternative 2 would occur using the same method described in Section 2.2.1.1. Pairs of steel sheet-piles would be driven between the king piles, through the sediment on the river bottom and into the bedrock, using a vibratory hammer.

Rock anchors would be installed in the bulkhead to provide lateral support (see Figure 2-2). The rock anchors would be drilled into the bedrock under the pier from the upper part of the waterside of the bulkhead. The rock anchors, spaced at approximately 12.5 feet on center, would laterally support the bulkheads. A temporary work platform consisting of either a trestle structure or jack-up barge would be installed off the berths to allow the construction contractor to install the king piles and sheet piles and drill and test the rock anchors. Additional in-water work also would be required under Alternative 2 to install steel H-type sister piles at the location of the inboard portal crane rail beam at Berths 11 and 13, including Berth 11C (see Figure 2-2). As described in Section 2.2.1, the sister piles would be driven into the bedrock below the pier using an impact hammer, through water generally less than 10 feet deep. The sister piles may be installed first, before each phase of the bulkhead is constructed, depending upon boat schedules at the berths. Table A-4 provides the approximate number of piles that would be installed at each berth.

Once the bulkhead is connected to the pier at both ends and closed off, the area inside the bulkhead and beneath the pier would be filled. Fill material (i.e., pea stone or loosely compacted granular

material) would be laid down inside of the bulkhead to an elevation within approximately 1 foot of the mean high water mark. Because limited dredging would be required under Alternative 2, it is assumed that the total amount of fill material required would be transported to the Shipyard from a permitted borrow source. An area of approximately 98,800 square feet would be filled, and a total of approximately 1,142,000 cubic feet (42,000 cubic yards) of fill material would be needed for Alternative 2, the same estimated amount of fill as that needed under Alternative 1.

Once the sister piles have been installed and fill material placed, the existing concrete jackets installed around the pier support piles during earlier repair work would be repaired along their uppermost 8 feet, the concrete removed from the pier deck during construction would be restored, and timber decking would be installed to span the gap of 3 to 8 feet between the existing timber deck and the bulkhead (MN-FST 2015b). The existing timber fender system at each berth would be replaced with polyethylene rub strips on the new bulkhead.

Once complete, the bulkhead would enclose and laterally support the piles, protect the pier's utility systems, prevent additional corrosion of the piles and thereby eliminate the expensive 10-year maintenance cycle, and restore the portal crane rail system's load-bearing capacity.

Option 1, Installation of Bulkhead at Berth 11C

The bulkhead installed at Berth 11C if Option 1 is implemented would extend from the western end of Berth 11B to the southern end of Berth 12. The total length of the bulkhead at Berths 11A, 11B, and 11C would be approximately 1,267 feet if Option 1 is implemented (see Figure 2-3). The in-water construction process would be the same as the process described above.

If Option 1 is implemented, the Navy would still install sister piles at the inboard rail beam as described above. Table 2-6 provides the approximate number of piles that would be installed at Berths 11, 12, and 13 under Alternative 2 with Option 1. If Option 1 is implemented, approximately 1,405,000 cubic feet (52,000 cubic yards) of fill material would be needed, and an area of approximately 118,800 square feet would be filled.

Table A-5 provides a comparison of the approximate total number of piles that would be installed at each berth under Alternatives 1 and 2.

Table A-5 Total Numbers of Piles under Alternatives 1 and 2[1]

Alternative	***1***	***1 (with Option 1)***	***2***	***2 (with Option 1)***
King Piles (Rock-socketed)	143	177	371	435
Sheet Piles (Driven)	69	69	736	864
Sheet-pile Returns (Driven)	172	129	172	129
Sister Piles (Driven)	87	87	87	87

Sources: MN-FST 2015b

Notes:
[1] Pile numbers are approximate.

A.2.1 Dry Dock 3 Caisson Replacement

As noted in Section A.1, this project would include removal and replacement of the Dry Dock 3 caisson and repair of the inner and outer caisson seats. This project would be completed between February 2017 and August 2018. Under Alternative 2, the Navy would construct a temporary, circular cellular cofferdam around the Dry Dock 3 caisson to create a dry work area in order to complete more extensive repairs on the outer caisson seat. Construction of the temporary cofferdam would occur at different times during the in-water work period and is anticipated to begin in July 2017 and be complete by November 2017. Replacement of the caisson and repair of the inner and outer concrete caisson seats would be scheduled around the operational schedule for Dry Dock 3, and the construction schedule may change due to mission requirements.

The temporary cofferdam would occupy an estimated footprint of 7,458 square feet, including the area enclosed by the cofferdam (an estimated 1,981 square feet). Before the temporary cofferdam is constructed, sediment would be dredged from the cofferdam footprint. The total amount of dredging required would not exceed the volume limits the USACE has approved for the Shipyard's regular maintenance dredging. During construction of the temporary cofferdam, a silt curtain and containment boom would be placed outside the in-water limit of potential disturbance, an estimated area of 25,000 square feet corresponding to the area in which bedrock grouting may be required to secure the cofferdam, as noted below.[5] The silt curtain and boom would contain re-suspended sediments and any debris resulting from construction.

The temporary cofferdam design consists primarily of three circular cells. To construct each cell, the cell frame (consisting of spud piles installed with an impact hammer) would first be erected, and sheet piles would then be set in place around the entire perimeter of the frame. The sheet piles would be installed through vibratory driving, with at least every fourth sheet pile secured to the frame with spud pile connections consisting of pins positioned through the spud pile and sheet pile. Any remaining surface sediments within the frame would be dredged, a concrete seal placed inside and around the cell using the tremie concrete placement method[6], and backfill placed inside the cell to the bottom of the cell frame. The cell frame would then be removed, and additional fill would be added to the cell and compacted with a vibratory probe.

Once the cells have been built, they would be connected by structures referred to as arcs. Frames for the arcs would be constructed between adjacent cells; then, sheet piles would be set and installed through vibratory driving. The approximate type and quantity of piles that would be required to construct the temporary cellular cofferdam are shown in Table A-3. Sediment would be removed from inside the arcs and concrete placed inside the arcs using the tremie concrete placement method. The arcs would then be backfilled, the arc frames removed, and the fill compacted with a vibratory probe. The dewatering operation for the entire cofferdam would begin once connections securing the cellular cofferdam to the dry dock have been tested and deemed safe. Once completed, the cofferdam would provide a dry work area enclosed by a wall of three concrete-filled sheet-pile cells connected by concrete-filled sheet-pile arcs.

[5] The limit of potential disturbance also accounts for variations in alignment or the potential need for support barges anchored with spuds.

[6] The tremie concrete placement method involves placing the end of a pipe below the water level and feeding concrete down the pipe. The end of the pipe is kept immersed in the fresh concrete being laid, which displaces the water from the area while preventing water from diluting the cement.

Table A-3 Numbers of Piles under Option 2, Cellular Cofferdam

Pile Type	*Number*
Spud piles	50
AS500 flat sheet-piles	500

Note: Pile numbers are approximate.

The Navy would build the outer cells of the cofferdam first to allow work to continue in Dry Dock 3 with minimal interruption. When in-water work would not interfere with mission operations at the dry dock, construction of the middle portion of the temporary cofferdam would be completed as described above.

The temporary cofferdam would be removed once the repair work and caisson replacement are complete. During removal, the cofferdam cells would be flooded, and temporary support braces would be installed near the top of each cell. Fill material added to stabilize the cofferdam would be dredged from each cell, the tremie slab would be demolished and debris removed, and the sheet piles would be removed with a vibratory hammer. Once all of the cells have been removed, the river bottom within the area of the cofferdam would be dredged to its final design depth, per USACE limits.

Appendix B
Coastal Consistency Determination

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Appendix C
Air Quality Calculations

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Waterfront Improvement Projects: Construction Emissions

	Emission Totals (tons)							
Activity	**VOC**	**NO_x**	**CO**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**CO_2**	**MTCO2**
Alternative 1								
Phase 1								
Berth 11 A and B	2.81	34.77	17.33	2.06	2.12	0.85	3,868	3,508
Option 1: Berth 11C	1.41	17.38	8.66	1.03	1.06	0.42	1,934	1,754
Dry Dock 3 Caisson	0.50	5.00	4.14	0.30	0.31	0.11	541	491
On-road Vehicle Operations, Phase 1	0.28	0.64	2.54	0.11	0.92	0.01	182	165
On-road Vehicle Operations, Phase 1, Option 1	0.19	0.35	1.78	0.07	0.60	0.006	109	99
Phase 1 Total	**3.60**	**40.41**	**24.01**	**2.47**	**3.35**	**0.97**	**4,591**	**4,164**
Phase 1 with Option C Total	**5.00**	**57.80**	**32.68**	**3.50**	**4.41**	**1.39**	**6,525**	**5,918**
Phase 2								-
Berth 12 and 13	2.81	34.77	17.33	2.06	2.12	0.85	3,868	3,508
On-road Vehicle Operations	0.20	0.62	1.82	0.09	0.72	0.01	157	143
Phase 2 Total	**3.02**	**35.39**	**19.14**	**2.15**	**2.84**	**0.86**	**4,025**	**3,651**
								-
Alternative 2								-
Phase 1								-
Berth 11 A and B	2.93	35.64	17.75	2.14	2.20	0.86	3,948	3,581
Option 1: Berth 11C	1.46	17.82	8.88	1.07	1.10	0.43	1,974	1,791
Dry Dock 3 Caisson	0.78	8.85	5.03	0.47	0.49	0.21	970	880
On-road Vehicle Operations, Phase 2	0.35	0.79	3.21	0.14	1.15	0.01	225	204
On-road Vehicle Operations, Phase 2, Option 1	0.20	0.37	1.86	0.07	0.63	0.01	116	106
Phase 1 Total	**4.06**	**45.28**	**26.00**	**2.75**	**3.84**	**1.09**	**5,144**	**4,666**
Phase 1 with Option C Total	**5.73**	**63.48**	**36.73**	**3.89**	**5.57**	**1.52**	**7,234**	**6,562**
Phase 2								-
Berth 12 and 13	2.53	30.67	16.33	1.88	1.93	0.76	3,437	3,118
On-road Vehicle Operations	0.20	0.64	1.82	0.09	0.72	0.01	161	146
Phase 2 Total	**2.74**	**31.31**	**18.15**	**1.97**	**2.65**	**0.77**	**3,598**	**3,263**

Construction Activities, Estimated Volumes, and On Road Vehicle Trips, Alternative 1

Action	Activity	Length (ft) or number	Width(ft)	Thickness (Ft)	Cubic Ft	Volume (cubic yard)	Cubic Yards per Truckload	Total # Loads
Alternative 1	Alternative 1							
Phase 1								
Berth 11, A and B	Concrete deck and rails removed	820	25	1	20500	759	20	38
	Timbers removed	70						
	Dolphins removed	7						
	Dredging removed					1,130	20	57
	Fill required					17,051	20	853
	King piles delivered	60						12
	Steel sheet piles delivered	103						21
	Equipment delivered							20
	Concrete delivered							20
	Total Berth 11 A and B							**1,020**
	Total Phase 1							1,020
Berth 11C	Concrete deck and rails removed	370	25	1	9250	343	20	17
	Timbers removed							
	Dredging removed					0		
	Fill required					8,631	20	432
	King piles delivered	34						6
	Steel sheet piles delivered							
	Equipment delivered							20
	Concrete delivered							
	Total Berth 11 C							**475**
Dry Dock 3 Caisson	Dredging removed					0		
	Sister pile delivered	0						0
	Sheet pile delivered	0						0
	Equipment delivered							20
	Total Dry Dock Caisson							**20**
	Total, Phase 1							**1,040**
	Total, Phase 1 with Option 1							**1,514**
Phase 2								
Berth 12	Concrete deck and rails removed	170	25	1	4250	157	20	8
	Timbers removed	37						
	Dredging removed					110	20	6
	Fill required					3,630	20	182
	King piles delivered	16						
	Steel sheet piles delivered	86						
	Equipment delivered							
	Concrete delivered							
	Total Berth 12					**3,897**		195
Berth 13	Concrete deck and rails removed	795	25	1	19875	736	20	37
	Timbers removed	66						
	Dolphins removed	13						
	Dredging removed					0		
	Fill required					17,361	20	868
	King piles delivered	67						
	Steel sheet piles delivered	43						
	Equipment delivered							
	Concrete delivered							
	Total Berth 13					**18,097**		**905**
	Total Phase 2							**1,100**

Construction Activities, Estimated Volumes, and On Road Vehicle Trips, Alternative 2

Action	Activity	Length (ft) or number	Width(ft)	Thickness (Ft)	Cubic Ft	Volume (cubic yard)	Cubic Yards per Truckload	Total # Loads
Alternative 2								
Phase 1								
Berth 11, A and B	Concrete deck and rails removed	820	25	1	20500	759	20	38
	Timbers removed	70						
	Dolphins removed	7						
	Dredging removed					1,130	20	57
	Fill required					17,051	20	853
	King piles delivered	176						35
	Steel sheet piles delivered	393						79
	Equipment delivered							20
	Concrete delivered							20
	Total Berth 11 A and B							**1,101**
	Total Phase 1							1,101
Berth 11C	Concrete deck and rails removed	370	25	1	9250	343	20	17
	Timbers removed							
	Dredging removed					0		
	Fill required					8,631	20	432
	King piles delivered	64						13
	Steel sheet piles delivered	128						26
	Equipment delivered							20
	Concrete delivered							20
	Total Berth 11 C							**527**
Dry Dock 3 Caisson	Dredging removed					0		
	Sister pile delivered	50						10
	Sheet pile delivered	500						100
	Equipment delivered							20
	Total Dry Dock Caisson							**130**
	Total, Phase 1							**1,231**
	Total, Phase 1 with Option 1							**1,758**
Phase 2								
Berth 12	Concrete deck and rails removed	170	25	1	4250	157	20	8
	Timbers removed	37						
	Dredging removed					110	20	6
	Fill required					3,630	20	182
	King piles delivered	16						
	Steel sheet piles delivered	86						
	Equipment delivered							
	Concrete delivered							20
	Total Berth 12					**3,897**		215
Berth 13	Concrete deck and rails removed	795	25	1	19875	736	20	37
	Timbers removed	66						
	Dolphins removed	13						
	Dredging removed					0		
	Fill required					17,361	20	868
	King piles delivered	67						
	Steel sheet piles delivered	43						
	Equipment delivered							
	Concrete delivered							20
	Total Berth 13					**18,097**		**925**
	Total Phase 2							**1,140**

Total Construction Equipment Emissions – Alternative 1 (Preferred Alternative)

Phase 1: Berth 11 A and B

Equipment Type	Number of Units	Days	Total Hours	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)							Emission totals (tons)						
						VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2	VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2
Crane, hydraulic, 12 ton	1	250	2000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.10	1.67	0.46	0.07	0.07	0.03	158.08
Crane, hydraulic, 33 tons	1	250	2000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.10	1.67	0.46	0.07	0.07	0.03	158.08
Crane, SP, 5 ton	1	250	2000	175	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.05	0.78	0.16	0.03	0.03	0.02	87.83
Crane, 40 ton	1	250	2000	350	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.11	1.55	0.31	0.07	0.07	0.04	175.66
Crane, 90-tons	1	250	2000	225	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.07	1.00	0.20	0.04	0.04	0.02	112.93
Crane, 150-tons	1	250	2000	282	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.09	1.25	0.25	0.05	0.06	0.03	141.53
Crawler-type drill, 4"	2	250	4000	260	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.45	6.37	2.61	0.39	0.40	0.16	728.07
Compressor, 250 cfm	2	250	4000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.11	1.37	0.90	0.13	0.13	0.04	200.91
Compressor, 600 cfm	1	250	2000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.03	0.34	0.22	0.03	0.03	0.01	50.23
Concrete pump, small	1	250	2000	53	43	0.75	6.18	3.03	0.56	0.57	0.12	567.14	0.04	0.31	0.15	0.03	0.03	0.01	28.44
Diesel hammer, 41k ft-lb	1	250	2000	101	43	0.34	4.1	0.87	0.18	0.17	0.16	539	0.03	0.39	0.08	0.02	0.02	0.02	51.50
Dozer, 300 HP	1	250	2000	300	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.13	1.84	0.75	0.11	0.12	0.05	210.02
Front end loader, 1.5 cy	2	250	4000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.47	6.37	2.64	0.40	0.42	0.15	680.59
Front end loader, TM, 2.5cy	2	250	4000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.47	6.37	2.64	0.40	0.42	0.15	680.59
Gas engine vibrator	1	250	2000	2	55	57.01	1.42	291.97	7.03	7.64	0.22	1053.35	0.14	0.00	0.71	0.02	0.02	0.00	2.55
Gas welding machine	1	250	2000	66	68	2.02	7.26	38.49	0.06	0.06	0.01	615.82	0.20	0.72	3.80	0.01	0.01	0.00	60.80
Grader, 30000 lb	1	250	2000	204	59	0.32	4.26	1.45	0.27	0.28	0.12	537.25	0.08	1.13	0.38	0.07	0.07	0.03	142.26
Hydraulic excavator, 3.5 cy	1	250	2000	148	59	0.34	4.1	0.87	0.18	0.17	0.16	541	0.07	0.79	0.17	0.03	0.03	0.03	103.93
Vibratory hammer and generator	1	250	2000	50	43	0.8	6.14	3.02	0.54	0.56	0.12	567.43	0.04	0.29	0.14	0.03	0.03	0.01	26.84
Vibratory roller	1	250	2000	92.3	59	0.42	4.77	2.49	0.4	0.41	0.12	558.97	0.05	0.57	0.30	0.05	0.05	0.01	66.97
Total Units	**24**										**Total Emissions**		**2.81**	**34.77**	**17.33**	**2.06**	**2.12**	**0.85**	**3,867.80**

Notes:

1. Avg hp from "USS Consititution Berth and Pier 1 Structural Repair. General Conformity Rule and Air Emissions Analysis," provided by K Moore, December 2014.
2. Load from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" EPA420-P-04-005. April 2004.
3. Emission factors from EPA's NONROAD model (Year 2014) and NR-009A, June 15, 1998.
4. Equipment Emission Rate = Average HP x Load x Emission Factor x 453.6 g/lb.
5. Construction would occur between October 2016 and June 2019. However, it is assumed that all activities would occur within one year

Total Construction Equipment Emissions – Alternative 1 (Preferred Alternative)

Phase 1: Berth 11C (Option 1)

Equipment Type	Number of Units	Days	Total Hours	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)							Emission totals (tons)						
						VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2	VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2
Crane, hydraulic, 12 ton	1	125	1000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.05	0.83	0.23	0.04	0.04	0.02	79.04
Crane, hydraulic, 33 tons	1	125	1000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.05	0.83	0.23	0.04	0.04	0.02	79.04
Crane, SP, 5 ton	1	125	1000	175	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.03	0.39	0.08	0.02	0.02	0.01	43.92
Crane, 40 ton	1	125	1000	350	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.05	0.78	0.16	0.03	0.03	0.02	87.83
Crane, 90-tons	1	125	1000	225	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.04	0.50	0.10	0.02	0.02	0.01	56.46
Crane, 150-tons	1	125	1000	282	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.04	0.63	0.13	0.03	0.03	0.01	70.77
Crawler-type drill, 4"	2	125	2000	260	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.22	3.19	1.30	0.20	0.20	0.08	364.03
Compressor, 250 cfm	2	125	2000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.05	0.68	0.45	0.06	0.06	0.02	100.45
Compressor, 600 cfm	1	125	1000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.01	0.17	0.11	0.02	0.02	0.01	25.11
Concrete pump, small	1	125	1000	53	43	0.75	6.18	3.03	0.56	0.57	0.12	567.14	0.02	0.15	0.08	0.01	0.01	0.00	14.22
Diesel hammer, 41k ft-lb	1	125	1000	101	43	0.34	4.1	0.87	0.18	0.17	0.16	539	0.02	0.20	0.04	0.01	0.01	0.01	25.75
Dozer, 300 HP	1	125	1000	300	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.06	0.92	0.38	0.06	0.06	0.02	105.01
Front end loader, 1.5 cy	2	125	2000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.23	3.19	1.32	0.20	0.21	0.08	340.29
Front end loader, TM, 2.5cy	2	125	2000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.23	3.19	1.32	0.20	0.21	0.08	340.29
Gas engine vibrator	1	125	1000	2	55	57.01	1.42	291.97	7.03	7.64	0.22	1053.35	0.07	0.00	0.35	0.01	0.01	0.00	1.27
Gas welding machine	1	125	1000	66	68	2.02	7.26	38.49	0.06	0.06	0.01	615.82	0.10	0.36	1.90	0.00	0.00	0.00	30.40
Grader, 30000 lb	1	125	1000	204	59	0.32	4.26	1.45	0.27	0.28	0.12	537.25	0.04	0.56	0.19	0.04	0.04	0.02	71.13
Hydraulic excavator, 3.5 cy	1	125	1000	148	59	0.34	4.1	0.87	0.18	0.17	0.16	541	0.03	0.39	0.08	0.02	0.02	0.02	51.96
Vibratory hammer and generator	1	125	1000	50	43	0.8	6.14	3.02	0.54	0.56	0.12	567.43	0.02	0.15	0.07	0.01	0.01	0.00	13.42
Vibratory roller	1	125	1000	92.3	59	0.42	4.77	2.49	0.4	0.41	0.12	558.97	0.03	0.29	0.15	0.02	0.02	0.01	33.48
Total Units	**24**										**Total Emissions**		**1.41**	**17.38**	**8.66**	**1.03**	**1.06**	**0.42**	**1,933.90**

Notes:

1. Avg hp from "USS Consititution Berth and Pier 1 Structural Repair. General Conformity Rule and Air Emissions Analysis," provided by K Moore, December 2014.
2. Load from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" EPA420-P-04-005. April 2004.
3. Emission factors from EPA's NONROAD model (Year 2014) and NR-009A, June 15, 1998.
4. Equipment Emission Rate = Average HP x Load x Emission Factor x 453.6 g/lb.
5. Construction would occur between October 2016 and June 2019. However, it is assumed that all activities would occur within one year

Total Construction Equipment Emissions – Alternative 1 (Preferred Alternative)

Phase 1: Dry Dock 3 Caisson

Equipment Type	Number of Units	Days	Total Hours	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)							Emission totals (tons)						
						VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2	VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2
Crane, hydraulic, 12 ton	0	125	0	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	-	-	-	-	-	-	-
Crane, hydraulic, 33 tons	1	125	1000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.05	0.83	0.23	0.04	0.04	0.02	79.04
Crane, SP, 5 ton	0	125	0	175	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	-	-	-	-	-	-	-
Crane, 40 ton	0	125	0	350	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	-	-	-	-	-	-	-
Crane, 90-tons	0	125	0	225	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	-	-	-	-	-	-	-
Crane, 150-tons	0	125	0	282	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	-	-	-	-	-	-	-
Crawler-type drill, 4"	1	125	1000	260	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.06	0.80	0.33	0.05	0.05	0.02	91.01
Compressor, 250 cfm	1	125	1000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.01	0.17	0.11	0.02	0.02	0.01	25.11
Compressor, 600 cfm	1	125	1000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.01	0.17	0.11	0.02	0.02	0.01	25.11
Concrete pump, small	1	125	1000	53	43	0.75	6.18	3.03	0.56	0.57	0.12	567.14	0.02	0.15	0.08	0.01	0.01	0.00	14.22
Diesel hammer, 41k ft-lb	0	125	0	101	43	0.34	4.1	0.87	0.18	0.17	0.16	539	-	-	-	-	-	-	-
Dozer, 300 HP	1	125	1000	300	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.06	0.92	0.38	0.06	0.06	0.02	105.01
Front end loader, 1.5 cy	1	125	1000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.06	0.80	0.33	0.05	0.05	0.02	85.07
Front end loader, TM, 2.5cy	1	125	1000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.06	0.80	0.33	0.05	0.05	0.02	85.07
Gas engine vibrator	1	125	1000	2	55	57.01	1.42	291.97	7.03	7.64	0.22	1053.35	0.07	0.00	0.35	0.01	0.01	0.00	1.27
Gas welding machine	1	125	1000	66	68	2.02	7.26	38.49	0.06	0.06	0.01	615.82	0.10	0.36	1.90	0.00	0.00	0.00	30.40
Grader, 30000 lb	0	125	0	204	59	0.32	4.26	1.45	0.27	0.28	0.12	537.25	-	-	-	-	-	-	-
Hydraulic excavator, 3.5 cy	0	125	0	148	59	0.34	4.1	0.87	0.18	0.17	0.16	541	-	-	-	-	-	-	-
Vibratory hammer and generator	0	125	0	50	43	0.8	6.14	3.02	0.54	0.56	0.12	567.43	-	-	-	-	-	-	-
Vibratory roller	0	125	0	92.3	59	0.42	4.77	2.49	0.4	0.41	0.12	558.97	-	-	-	-	-	-	-
Total Units	**10**										**Total Emissions**		**0.50**	**5.00**	**4.14**	**0.30**	**0.31**	**0.11**	**541.33**

Notes:

1. Avg hp from "USS Consititution Berth and Pier 1 Structural Repair. General Conformity Rule and Air Emissions Analysis," provided by K Moore, December 2014.
2. Load from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" EPA420-P-04-005. April 2004.
3. Emission factors from EPA's NONROAD model (Year 2014) and NR-009A, June 15, 1998.
4. Equipment Emission Rate = Average HP x Load x Emission Factor x 453.6 g/lb.
5. Construction would occur between October 2016 and May 2019. However, it is assumed that all activities would occur within one year.

Total Construction Equipment Emissions – Alternative 1 (Preferred Alternative)

Phase 2: Berth 12 and 13

Equipment Type	Number of Units	Days	Total Hours	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)							Emission totals (tons)						
						VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2	VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2
Crane, hydraulic, 12 ton	1	250	2000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.10	1.67	0.46	0.07	0.07	0.03	158.08
Crane, hydraulic, 33 tons	1	250	2000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.10	1.67	0.46	0.07	0.07	0.03	158.08
Crane, SP, 5 ton	1	250	2000	175	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.05	0.78	0.16	0.03	0.03	0.02	87.83
Crane, 40 ton	1	250	2000	350	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.11	1.55	0.31	0.07	0.07	0.04	175.66
Crane, 90-tons	1	250	2000	225	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.07	1.00	0.20	0.04	0.04	0.02	112.93
Crane, 150-tons	1	250	2000	282	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.09	1.25	0.25	0.05	0.06	0.03	141.53
Crawler-type drill, 4"	2	250	4000	260	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.45	6.37	2.61	0.39	0.40	0.16	728.07
Compressor, 250 cfm	2	250	4000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.11	1.37	0.90	0.13	0.13	0.04	200.91
Compressor, 600 cfm	1	250	2000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.03	0.34	0.22	0.03	0.03	0.01	50.23
Concrete pump, small	1	250	2000	53	43	0.75	6.18	3.03	0.56	0.57	0.12	567.14	0.04	0.31	0.15	0.03	0.03	0.01	28.44
Diesel hammer, 41k ft-lb	1	250	2000	101	43	0.34	4.1	0.87	0.18	0.17	0.16	539	0.03	0.39	0.08	0.02	0.02	0.02	51.50
Dozer, 300 HP	1	250	2000	300	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.13	1.84	0.75	0.11	0.12	0.05	210.02
Front end loader, 1.5 cy	2	250	4000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.47	6.37	2.64	0.40	0.42	0.15	680.59
Front end loader, TM, 2.5cy	2	250	4000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.47	6.37	2.64	0.40	0.42	0.15	680.59
Gas engine vibrator	1	250	2000	2	55	57.01	1.42	291.97	7.03	7.64	0.22	1053.35	0.14	0.00	0.71	0.02	0.02	0.00	2.55
Gas welding machine	1	250	2000	66	68	2.02	7.26	38.49	0.06	0.06	0.01	615.82	0.20	0.72	3.80	0.01	0.01	0.00	60.80
Grader, 30000 lb	1	250	2000	204	59	0.32	4.26	1.45	0.27	0.28	0.12	537.25	0.08	1.13	0.38	0.07	0.07	0.03	142.26
Hydraulic excavator, 3.5 cy	1	250	2000	148	59	0.34	4.1	0.87	0.18	0.17	0.16	541	0.07	0.79	0.17	0.03	0.03	0.03	103.93
Vibratory hammer and generator	1	250	2000	50	43	0.8	6.14	3.02	0.54	0.56	0.12	567.43	0.04	0.29	0.14	0.03	0.03	0.01	26.84
Vibratory roller	1	250	2000	92.3	59	0.42	4.77	2.49	0.4	0.41	0.12	558.97	0.05	0.57	0.30	0.05	0.05	0.01	66.97
Total Units	**24**											**Total Emissions**	**2.81**	**34.77**	**17.33**	**2.06**	**2.12**	**0.85**	**3,867.80**

Notes:

1. Avg hp from "USS Consititution Berth and Pier 1 Structural Repair. General Conformity Rule and Air Emissions Analysis," provided by K Moore, December 2014.
2. Load from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" EPA420-P-04-005. April 2004.
3. Emission factors from EPA's NONROAD model (Year 2014) and NR-009A, June 15, 1998.
4. Equipment Emission Rate = Average HP x Load x Emission Factor x 453.6 g/lb.
5. Construction would occur between October 2020 and March 2022. However, it is assumed that all activities would occur within one year (250 days)

Total Construction Equipment Emissions – Alternative 2

Phase 1: Berth 11 A and B

Equipment Type	Number of Units	Days	Total Hours	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)							Emission totals (tons)						
						VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2	VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2
Crane, hydraulic, 12 ton	1	250	2000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.10	1.67	0.46	0.07	0.07	0.03	158.08
Crane, hydraulic, 33 tons	1	250	2000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.10	1.67	0.46	0.07	0.07	0.03	158.08
Crane, SP, 5 ton	1	250	2000	175	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.05	0.78	0.16	0.03	0.03	0.02	87.83
Crane, 40 ton	1	250	2000	350	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.11	1.55	0.31	0.07	0.07	0.04	175.66
Crane, 90-tons	1	250	2000	225	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.07	1.00	0.20	0.04	0.04	0.02	112.93
Crane, 150-tons	1	250	2000	282	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.09	1.25	0.25	0.05	0.06	0.03	141.53
Crawler-type drill, 4"	2	250	4000	260	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.45	6.37	2.61	0.39	0.40	0.16	728.07
Compressor, 250 cfm	2	250	4000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.11	1.37	0.90	0.13	0.13	0.04	200.91
Compressor, 600 cfm	1	250	2000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.03	0.34	0.22	0.03	0.03	0.01	50.23
Concrete pump, small	1	250	2000	53	43	0.75	6.18	3.03	0.56	0.57	0.12	567.14	0.04	0.31	0.15	0.03	0.03	0.01	28.44
Diesel hammer, 41k ft-lb	1	250	2000	101	43	0.34	4.1	0.87	0.18	0.17	0.16	539	0.03	0.39	0.08	0.02	0.02	0.02	51.50
Dozer, 300 HP	1	250	2000	300	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.13	1.84	0.75	0.11	0.12	0.05	210.02
Front end loader, 1.5 cy	2	250	4000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.47	6.37	2.64	0.40	0.42	0.15	680.59
Front end loader, TM, 2.5cy	2	250	4000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.47	6.37	2.64	0.40	0.42	0.15	680.59
Gas engine vibrator	1	250	2000	2	55	57.01	1.42	291.97	7.03	7.64	0.22	1053.35	0.14	0.00	0.71	0.02	0.02	0.00	2.55
Gas welding machine	1	250	2000	66	68	2.02	7.26	38.49	0.06	0.06	0.01	615.82	0.20	0.72	3.80	0.01	0.01	0.00	60.80
Grader, 30000 lb	1	250	2000	204	59	0.32	4.26	1.45	0.27	0.28	0.12	537.25	0.08	1.13	0.38	0.07	0.07	0.03	142.26
Hydraulic excavator, 3.5 cy	1	250	2000	148	59	0.34	4.1	0.87	0.18	0.17	0.16	541	0.07	0.79	0.17	0.03	0.03	0.03	103.93
Vibratory hammer and generator	2	250	4000	50	43	0.8	6.14	3.02	0.54	0.56	0.12	567.43	0.15	1.16	0.57	0.10	0.11	0.02	107.36
Vibratory roller	1	250	2000	92.3	59	0.42	4.77	2.49	0.4	0.41	0.12	558.97	0.05	0.57	0.30	0.05	0.05	0.01	66.97
Total Units	**25**											**Total Emissions**	**2.93**	**35.64**	**17.75**	**2.14**	**2.20**	**0.86**	**3,948.32**

Notes:

1. Avg hp from "USS Consititution Berth and Pier 1 Structural Repair. General Conformity Rule and Air Emissions Analysis," provided by K Moore, December 2014.
2. Load from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" EPA420-P-04-005. April 2004.
3. Emission factors from EPA's NONROAD model (Year 2014) and NR-009A, June 15, 1998.
4. Equipment Emission Rate = Average HP x Load x Emission Factor x 453.6 g/lb.
5. Construction would occur between October 2016 and June 2019. However, it is assumed that all activities would occur within one year

Total Construction Equipment Emissions – Alternative 1 (Preferred Alternative)

Phase 1: Berth 11C (Option 1)

Equipment Type	Number of Units	Days	Total Hours	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)							Emission totals (tons)						
						VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2	VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2
Crane, hydraulic, 12 ton	1	125	1000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.05	0.83	0.23	0.04	0.04	0.02	79.04
Crane, hydraulic, 33 tons	1	125	1000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.05	0.83	0.23	0.04	0.04	0.02	79.04
Crane, SP, 5 ton	1	125	1000	175	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.03	0.39	0.08	0.02	0.02	0.01	43.92
Crane, 40 ton	1	125	1000	350	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.05	0.78	0.16	0.03	0.03	0.02	87.83
Crane, 90-tons	1	125	1000	225	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.04	0.50	0.10	0.02	0.02	0.01	56.46
Crane, 150-tons	1	125	1000	282	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.04	0.63	0.13	0.03	0.03	0.01	70.77
Crawler-type drill, 4"	2	125	2000	260	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.22	3.19	1.30	0.20	0.20	0.08	364.03
Compressor, 250 cfm	2	125	2000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.05	0.68	0.45	0.06	0.06	0.02	100.45
Compressor, 600 cfm	1	125	1000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.01	0.17	0.11	0.02	0.02	0.01	25.11
Concrete pump, small	1	125	1000	53	43	0.75	6.18	3.03	0.56	0.57	0.12	567.14	0.02	0.15	0.08	0.01	0.01	0.00	14.22
Diesel hammer, 41k ft-lb	1	125	1000	101	43	0.34	4.1	0.87	0.18	0.17	0.16	539	0.02	0.20	0.04	0.01	0.01	0.01	25.75
Dozer, 300 HP	1	125	1000	300	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.06	0.92	0.38	0.06	0.06	0.02	105.01
Front end loader, 1.5 cy	2	125	2000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.23	3.19	1.32	0.20	0.21	0.08	340.29
Front end loader, TM, 2.5cy	2	125	2000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.23	3.19	1.32	0.20	0.21	0.08	340.29
Gas engine vibrator	1	125	1000	2	55	57.01	1.42	291.97	7.03	7.64	0.22	1053.35	0.07	0.00	0.35	0.01	0.01	0.00	1.27
Gas welding machine	1	125	1000	66	68	2.02	7.26	38.49	0.06	0.06	0.01	615.82	0.10	0.36	1.90	0.00	0.00	0.00	30.40
Grader, 30000 lb	1	125	1000	204	59	0.32	4.26	1.45	0.27	0.28	0.12	537.25	0.04	0.56	0.19	0.04	0.04	0.02	71.13
Hydraulic excavator, 3.5 cy	1	125	1000	148	59	0.34	4.1	0.87	0.18	0.17	0.16	541	0.03	0.39	0.08	0.02	0.02	0.02	51.96
Vibratory hammer and generator	2	125	2000	50	43	0.8	6.14	3.02	0.54	0.56	0.12	567.43	0.08	0.58	0.29	0.05	0.05	0.01	53.68
Vibratory roller	1	125	1000	92.3	59	0.42	4.77	2.49	0.4	0.41	0.12	558.97	0.03	0.29	0.15	0.02	0.02	0.01	33.48
Total Units	**25**										**Total Emissions**		**1.46**	**17.82**	**8.88**	**1.07**	**1.10**	**0.43**	**1,974.16**

Notes:

1. Avg hp from "USS Consititution Berth and Pier 1 Structural Repair. General Conformity Rule and Air Emissions Analysis," provided by K Moore, December 2014.
2. Load from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" EPA420-P-04-005. April 2004.
3. Emission factors from EPA's NONROAD model (Year 2014) and NR-009A, June 15, 1998.
4. Equipment Emission Rate = Average HP x Load x Emission Factor x 453.6 g/lb.
5. Construction would occur between October 2016 and June 2019. However, it is assumed that all activities would occur within one year

Total Construction Equipment Emissions – Alternative 1 (Preferred Alternative)

Phase 1: Dry Dock 3 Caisson

Equipment Type	Number of Units	Days	Total Hours	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)							Emission totals (tons)						
						VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2	VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2
Crane, hydraulic, 12 ton	1	125	1000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.05	0.83	0.23	0.04	0.04	0.02	79.04
Crane, hydraulic, 33 tons	1	125	1000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.05	0.83	0.23	0.04	0.04	0.02	79.04
Crane, SP, 5 ton	1	125	1000	175	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.03	0.39	0.08	0.02	0.02	0.01	43.92
Crane, 40 ton	1	125	1000	350	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.05	0.78	0.16	0.03	0.03	0.02	87.83
Crane, 90-tons	1	125	1000	225	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.04	0.50	0.10	0.02	0.02	0.01	56.46
Crane, 150-tons	1	125	1000	282	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.04	0.63	0.13	0.03	0.03	0.01	70.77
Crawler-type drill, 4"	1	125	1000	260	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.06	0.80	0.33	0.05	0.05	0.02	91.01
Compressor, 250 cfm	1	125	1000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.01	0.17	0.11	0.02	0.02	0.01	25.11
Compressor, 600 cfm	1	125	1000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.01	0.17	0.11	0.02	0.02	0.01	25.11
Concrete pump, small	1	125	1000	53	43	0.75	6.18	3.03	0.56	0.57	0.12	567.14	0.02	0.15	0.08	0.01	0.01	0.00	14.22
Diesel hammer, 41k ft-lb	1	125	1000	101	43	0.34	4.1	0.87	0.18	0.17	0.16	539	0.02	0.20	0.04	0.01	0.01	0.01	25.75
Dozer, 300 HP	1	125	1000	300	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.06	0.92	0.38	0.06	0.06	0.02	105.01
Front end loader, 1.5 cy	1	125	1000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.06	0.80	0.33	0.05	0.05	0.02	85.07
Front end loader, TM, 2.5cy	1	125	1000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.06	0.80	0.33	0.05	0.05	0.02	85.07
Gas engine vibrator	1	125	1000	2	55	57.01	1.42	291.97	7.03	7.64	0.22	1053.35	0.07	0.00	0.35	0.01	0.01	0.00	1.27
Gas welding machine	1	125	1000	66	68	2.02	7.26	38.49	0.06	0.06	0.01	615.82	0.10	0.36	1.90	0.00	0.00	0.00	30.40
Grader, 30000 lb	0	125	0	204	59	0.32	4.26	1.45	0.27	0.28	0.12	537.25	-	-	-	-	-	-	-
Hydraulic excavator, 3.5 cy	1	125	1000	148	59	0.34	4.1	0.87	0.18	0.17	0.16	541	0.03	0.39	0.08	0.02	0.02	0.02	51.96
Vibratory hammer and generator	1	125	1000	50	43	0.8	6.14	3.02	0.54	0.56	0.12	567.43	0.02	0.15	0.07	0.01	0.01	0.00	13.42
Vibratory roller	0	125	0	92.3	59	0.42	4.77	2.49	0.4	0.41	0.12	558.97	-	-	-	-	-	-	-
Total Units	**18**										**Total Emissions**		**0.78**	**8.85**	**5.03**	**0.47**	**0.49**	**0.21**	**970.48**

Notes:

1. Avg hp from "USS Consititution Berth and Pier 1 Structural Repair. General Conformity Rule and Air Emissions Analysis," provided by K Moore, December 2014.
2. Load from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" EPA420-P-04-005. April 2004.
3. Emission factors from EPA's NONROAD model (Year 2014) and NR-009A, June 15, 1998.
4. Equipment Emission Rate = Average HP x Load x Emission Factor x 453.6 g/lb.
5. Construction would occur between October 2016 and May 2019. However, it is assumed that all activities would occur within one year

Total Construction Equipment Emissions – Alternative 2

Phase 2: Berth 12 and 13

Equipment Type	Number of Units	Days	Total Hours	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)							Emission totals (tons)						
						VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2	VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2
Crane, hydraulic, 12 ton	1	125	1000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.05	0.83	0.23	0.04	0.04	0.02	79.04
Crane, hydraulic, 33 tons	1	125	1000	315	43	0.34	5.59	1.55	0.25	0.25	0.11	530.5	0.05	0.83	0.23	0.04	0.04	0.02	79.04
Crane, SP, 5 ton	1	125	1000	175	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.03	0.39	0.08	0.02	0.02	0.01	43.92
Crane, 40 ton	1	125	1000	350	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.05	0.78	0.16	0.03	0.03	0.02	87.83
Crane, 90-tons	1	125	1000	225	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.04	0.50	0.10	0.02	0.02	0.01	56.46
Crane, 150-tons	1	125	1000	282	43	0.33	4.69	0.94	0.2	0.21	0.11	530.54	0.04	0.63	0.13	0.03	0.03	0.01	70.77
Crawler-type drill, 4"	2	250	4000	260	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.45	6.37	2.61	0.39	0.40	0.16	728.07
Compressor, 250 cfm	2	250	4000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.11	1.37	0.90	0.13	0.13	0.04	200.91
Compressor, 600 cfm	1	250	2000	90	43	0.32	4.01	2.63	0.37	0.38	0.13	589.94	0.03	0.34	0.22	0.03	0.03	0.01	50.23
Concrete pump, small	1	250	2000	53	43	0.75	6.18	3.03	0.56	0.57	0.12	567.14	0.04	0.31	0.15	0.03	0.03	0.01	28.44
Diesel hammer, 41k ft-lb	1	250	2000	101	43	0.34	4.1	0.87	0.18	0.17	0.16	539	0.03	0.39	0.08	0.02	0.02	0.02	51.50
Dozer, 300 HP	1	250	2000	300	59	0.33	4.72	1.93	0.29	0.3	0.12	539.34	0.13	1.84	0.75	0.11	0.12	0.05	210.02
Front end loader, 1.5 cy	2	250	4000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.47	6.37	2.64	0.40	0.42	0.15	680.59
Front end loader, TM, 2.5cy	2	250	4000	243	59	0.37	5.05	2.09	0.32	0.33	0.12	539.44	0.47	6.37	2.64	0.40	0.42	0.15	680.59
Gas engine vibrator	1	250	2000	2	55	57.01	1.42	291.97	7.03	7.64	0.22	1053.35	0.14	0.00	0.71	0.02	0.02	0.00	2.55
Gas welding machine	1	250	2000	66	68	2.02	7.26	38.49	0.06	0.06	0.01	615.82	0.20	0.72	3.80	0.01	0.01	0.00	60.80
Grader, 30000 lb	1	250	2000	204	59	0.32	4.26	1.45	0.27	0.28	0.12	537.25	0.08	1.13	0.38	0.07	0.07	0.03	142.26
Hydraulic excavator, 3.5 cy	1	250	2000	148	59	0.34	4.1	0.87	0.18	0.17	0.16	541	0.07	0.79	0.17	0.03	0.03	0.03	103.93
Vibratory hammer and generator	1	125	1000	50	43	0.8	6.14	3.02	0.54	0.56	0.12	567.43	0.02	0.15	0.07	0.01	0.01	0.00	13.42
Vibratory roller	1	250	2000	92.3	59	0.42	4.77	2.49	0.4	0.41	0.12	558.97	0.05	0.57	0.30	0.05	0.05	0.01	66.97
Total Units	**24**											**Total Emissions**	**2.53**	**30.67**	**16.33**	**1.88**	**1.93**	**0.76**	**3,437.32**

Notes:

1. Avg hp from "USS Consititution Berth and Pier 1 Structural Repair. General Conformity Rule and Air Emissions Analysis," provided by K Moore, December 2014.
2. Load from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" EPA420-P-04-005. April 2004.
3. Emission factors from EPA's NONROAD model (Year 2014) and NR-009A, June 15, 1998.
4. Equipment Emission Rate = Average HP x Load x Emission Factor x 453.6 g/lb.
5. Construction would occur between October 2020 and March 2022. However, it is assumed that all activities would occur within one year

Onroad Vehicle Exhaust Emission Factors

Equipment Type	Fuel Type	Exhaust Emission Factor[a] (g/VMT)							Road Dust Emission Factor[d] (g/VMT)		Total PM Emission Factor[e] (g/VMT)	
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Gasoline Light Trucks	Gasoline	1.03	9.40	0.69	0.0106	0.0044	0.0041	368	3.13	0.341	3.13	0.345
Gasoline Passenger Cars	Gasoline	1.22	11.84	0.95	0.0147	0.0049	0.0045	514	3.13	0.341	3.13	0.346
Average Gasoline Vehicles	Gasoline	1.13	10.62	0.82	0.013	0.005	0.004	440.95	3.13	0.341	3.13	0.346
Diesel Vehicles	Diesel	0.28	1.10	8.06	0.158	0.17	0.17	1,400	3.13	0.341	3.30	0.511

Notes:

a. Emission factors for gasoline worker vehicles from "Emission Facts: Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks (EPA420-F-08-024, EPA 2008). It was assumed that the vehicle make-up included 50% cars and 50% light-duty trucks/SUVs.

b. Emission factors for diesel worker and delivery vehicles (except SO2 and CO2) from "Assessing the Effects of Freight Movement on Air Quality at the National and Regional Level- Final Report" (U.S. Federal Highway Administration 2005).

c. CO2 and SO_2 emission factors for diesel worker and delivery vehicles from "Greenhouse Gas Protocol - Corporate Accounting and Reporting Standard / Mobile Guide" (World Resources Institute/World Business Council for Sustainable Development 2005). SO2 emission factor calculated from diesel consumption rate and a sulfur content of 348 ppm.

d. See emission factor derivation table below.

e. Sum of exhaust and road dust emission factors.

Paved Roads - Emission Factor Derivation Table

$E = (k(sL/2)^{0.65}(W/3)^{1.5}-C)$ AP-42 Section 13.2.1 (11/06 version)

where:

E = particulate emission factor (lb/VMT)
k = particle size multiplier
sL = road surface silt loading (g/m^2)
W = average vehicle weight (tons)
C = emission factor for 1980's vehicle fleet exhaust, break wear and tire wear

Parameter	Units	PM_{10}	$PM_{2.5}$	Reference
Mean Vehicle Weight	tons	3	3	Assumption
k factor	g/VMT	7.3	1.1	Table 13.2-1.1
Silt Loading, sL	g/m^2	0.6	0.6	Table 13.2.1-3
Emission factor, C	g/VMT	0.2119	0.1617	Table 13.2.1-2
Emission factor, E	g/VMT	3.13	0.341	Table 13.2.1-3

Emissions from On Road Vehicle Activity

						Emissions TPY						
Source	# workers	Average commute (miles)	# Work Days	Total # of Trips	Total Vehicle miles traveled (VMT)	VOC	NOx	CO	$PM_{2.5}$	PM_{10}	SO2	CO2
Alternative 1, Phase 1												
Worker Commute	34	25	250	8,500	212,500	0.264	0.192	2.482	0.081	0.732	0.003	103.07
Deliveries		50		1,020	50,981	0.016	0.452	0.062	0.029	0.185	0.009	78.51
						0.280	**0.644**	**2.544**	**0.109**	**0.917**	**0.012**	**181.58**
Alternative 1,Phase 1, Option 1 (Only)												
Worker Commute	24	25	250	6,000	150,000	0.186	0.136	1.752	0.057	0.517	0.002	72.76
Deliveries		50		475	23,734	0.007	0.210	0.029	0.013	0.086	0.004	36.55
						0.194	**0.346**	**1.781**	**0.070**	**0.603**	**0.006**	**109.31**
Alternative 1, Phase 2												
Worker Commute	24	25	250	6,000	150,000	0.186	0.136	1.752	0.057	0.517	0.002	72.76
Deliveries		50		1,100	54,986	0.017	0.488	0.067	0.031	0.199	0.010	84.68
						0.203	**0.623**	**1.819**	**0.088**	**0.716**	**0.012**	**157.44**
Alternative 2, Phase 1												
Worker Commute	43	25	250	10,750	268,750	0.334	0.243	3.140	0.102	0.925	0.004	130.36
Deliveries		50		1,231	61,541	0.019	0.546	0.074	0.035	0.223	0.011	94.77
						0.353	**0.788**	**3.214**	**0.137**	**1.149**	**0.014**	**225.13**
Alternative 2, Phase 1, Option 1 (only)												
Worker Commute	25	25	250	6,250	156,250	0.194	0.141	1.825	0.059	0.538	0.002	75.79
Deliveries		50		527	26,354	0.008	0.234	0.032	0.015	0.096	0.005	40.59
						0.202	**0.375**	**1.857**	**0.074**	**0.634**	**0.007**	**116.37**
Alternative 2, Phase 2												
Worker Commute	24	25	250	6,000	150,000	0.186	0.136	1.752	0.057	0.517	0.002	72.76
Deliveries		50		1,140	56,986	0.018	0.505	0.069	0.032	0.207	0.010	87.76
						0.204	**0.641**	**1.821**	**0.089**	**0.723**	**0.012**	**160.52**

Notes

a. Analysis conservatively assumes all construction in Phase 1 would occur in one year, and construction in Phase 2 would occur within a different year.

b. 250 workdays/year.

c. Refer to table 'Onroad Vehicle Exhaust Emission Factors' for emission factors

d. Analysis assumes one worker for each piece of equipment used

Appendix D
National Historic Preservation Act Section 106 Documentation

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Appendix E
Tribal Government-to-Government Documentation

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Appendix F
Marine Mammal Protection Act Documentation

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Appendix G
Magnuson-Stevens Fishery Conservation and Management Reauthorization Act Documentation

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Appendix H
Endangered Species Act Documentation

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1002860.WE21.07 B4458

Incidental Harassment Authorization Application for Waterfront Improvement Projects at Portsmouth Naval Shipyard Kittery, Maine

January 1, 2017, through December 31, 2017

January 2016

Submitted to:

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

Prepared by:

For:
U.S. Department of the Navy
Commanding Officer, Portsmouth Naval Shipyard
Kittery, Maine

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Acronyms and Abbreviations

µ	micro
µPa	micro Pascals
°F	degrees Fahrenheit
CeTAP	Cetaceans and Turtle Assessment Program
CIA	controlled industrial area
CNO	Chief of Naval Operations
CV	coefficient of variation
dB	decibel
EA	environmental assessment
ESA	Endangered Species Act
FHWG	Fisheries Hydroacoustic Working Group
HVAC	heating, ventilation, and air conditioning
Hz	hertz
km	kilometer
L_{eq}	equivalent sound level
MMPA	Marine Mammal Protection Act
NAVSEA	Naval Sea Systems Command
NOAA	National Oceanic and Atmospheric Administration
Pa	Pascal
ppt	parts per thousand
PTS	permanent threshold shift
rms	root-mean-squared
SEL	sound exposure level
SPL	sound pressure level

TL	transmission loss
TTS	temporary threshold shift
U.S.C.	U.S. Code
USCG	U.S. Coast Guard
ZOI	zone of influence

1 Description of the Activity

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

The U.S. Department of the Navy (Navy) is proposing to restore and modernize waterfront infrastructure associated with Dry Docks 1 and 3 at Portsmouth Naval Shipyard (the Shipyard) in Kittery, York County, Maine. The proposed action would include two waterfront improvement projects, structural repairs to Berths 11, 12, and 13, and replacement of the Dry Dock 3 caisson. The waterfront improvement projects would be constructed between October 2016 and October 2022, with in-water work expected to begin no earlier than January 2017. The Navy is preparing an environmental assessment (EA) to analyze the potential environmental consequences of the proposed action.

1.2 Proposed Action

The Shipyard is located in Kittery, Maine, on Seavey Island in the Piscataqua River, which flows between Maine and New Hampshire (see Figure 1-1). The Shipyard occupies the whole of Seavey Island, encompassing 278 acres on what were originally five separate islands (Seavey, Pumpkin, Dennett's, Clarks, and Jamaica). Over the past 200 years, as a result of expansion from land-making activity, four of these islands (Seavey, Pumpkin, Dennett's, and Jamaica) were consolidated into one large island, which kept the name Seavey Island. Clarks Island is now attached to Seavey Island by a causeway.

The purpose of the proposed action is to modernize and maximize dry dock capabilities for performing current and future missions efficiently and with maximum flexibility. The need for the proposed action is to correct deficiencies associated with the pier structure at Berths 11, 12, and 13 and the Dry Dock 3 caisson and concrete seats and ensure that the Shipyard can continue to support its primary mission to service, maintain, and overhaul submarines. By supporting the Shipyard's mission, the proposed action would assist in meeting the larger need for the Navy to provide capabilities for training and equipping combat-capable naval forces ready to deploy worldwide. In this regard, the proposed action furthers the Navy's execution of its congressionally mandated roles and responsibilities under 10 United States Code [U.S.C.] Section 5062.

The Shipyard's physical environment and industrial operations have evolved over its long history to meet changing mission requirements. The Shipyard's dry docks were constructed between 1900 and 1943 and remain the core of the Shipyard's operations today. The Shipyard's dry docks are located in the controlled industrial area (CIA), which is fenced and has controlled access at several gates to provide security for dry dock operations. Each dry dock's mission is described below:

> **Dry Dock 1 –** Supports Chief of Naval Operations (CNO)-mandated engineering overhauls of *Los Angeles*-class submarines. During engineering overhauls, a submarine's components are disassembled, thoroughly cleaned or replaced if worn out, and then reassembled.
>
> **Dry Dock 2 –** Supports fuel servicing, maintenance, and overhaul of *Los Angeles*-class submarines.
>
> **Dry Dock 3 –** Supports maintenance and overhaul of *Virginia*-class submarines. Dry Dock 3 is the Shipyard's premier *Virginia*-class dry dock.

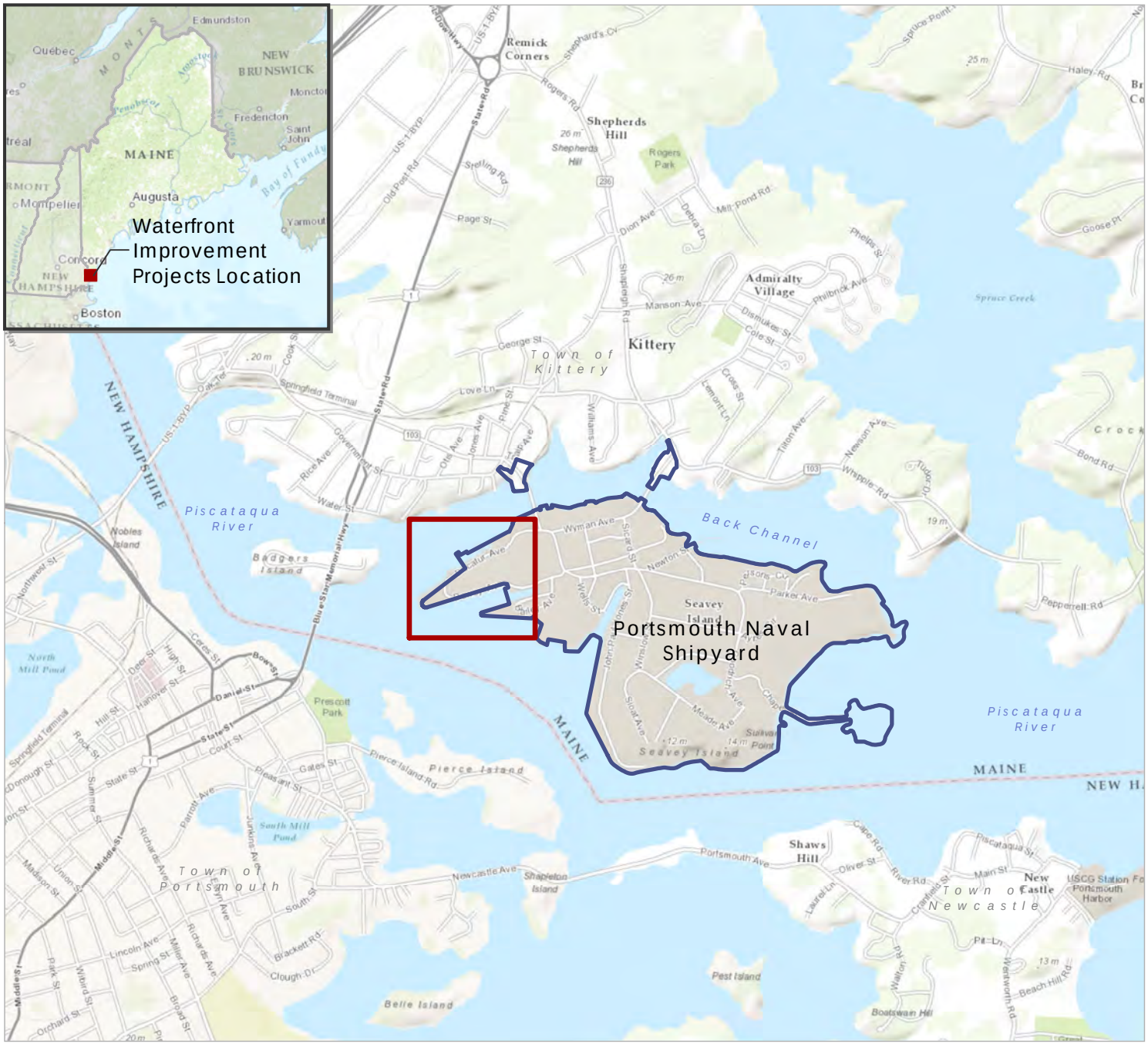

Figure 1-1
Location Map
Portsmouth Naval Shipyard
York County, Maine

Legend

Installation Area

N

0 1,000 2,000 3,000 4,000 Feet

Source: ESRI 2013; Department of Defense 2014.

Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\IHA_Application\Figure_1-1_Regional Map.mxd

Berths 11, 12, and 13

The pier infrastructure at Berths 11, 12, and 13 supports part of the west circuit of the Shipyard's portal crane rail system (see Figure 1-2). Portal cranes, which are track-mounted cranes on a central shaft atop four steel legs, are used to preassemble pieces of submarines, move them to a dry dock, and lift or reposition them as needed. Portal cranes also are used to lift and move large equipment. Age-related structural weaknesses in this pier, called the "fitting-out" pier, directly impact operation of the west circuit of the portal crane rail system—and consequently impact maintenance schedules and the associated costs of maintenance services at Dry Docks 1 and 3. The sides of the pier are open at Berths 11, 12, and 13, and water action has corroded the steel piles over the decades, weakening the overall structure that supports the portal crane rail system. Accelerated corrosion of the piles at Berths 11, 12, and 13 has reduced and will continue to reduce the rated load-bearing capacity of these piles—or the maximum weight they can support with limited risk of failure, which, in turn, prevents the Shipyard's portal cranes from operating at their full 60-ton load-bearing capacity. The Shipyard has been maintaining the piles at the fitting-out pier by installing pile jackets (i.e., fabric pouches that are installed around a pile over steel reinforcing bars and then filled with mortar). However, when pile jackets are installed, the rated load-bearing capacity of the piles must be reduced because of a combination of the reduced strength of the piles and the added weight of the pile jackets. Erosion of soil from the open sides of the pier and age-related failure of the pier deck additionally affect the structural integrity of these berths.

Dry Dock 3 Caisson and Seats

The steel caisson and seats at the entrance to Dry Dock 3 form the watertight enclosure for the dry dock. The existing caisson has been in use since 1962, has reached the end of its service life, and is showing signs of deterioration. At the inner and outer caisson seats, spalled concrete (i.e., concrete that has broken, flaked, or become pitted) allows some seawater to infiltrate the dry dock. Failure of either the caisson or caisson seats would cause uncontrolled flooding of the dry dock, potentially resulting in major damage to multi-billion-dollar vessels and injuries to personnel working in the dry dock. The caisson and caisson seats may no longer meet the requirements of the Naval Sea Systems Command (NAVSEA) Safety Certification Program for dry-docking facilities if they continue to deteriorate (Department of Defense [DOD] Standard Practice 1625C [SH] [MIL-STD-1625C[SH] 29 1987).

Alternative Addressed in this Application

The EA for the proposed action analyzes two action alternatives. Alternative 1, the Preferred Alternative, incorporates in-water construction techniques at Berths 11, 12, and 13 and the Dry Dock 3 caisson that would require less (or no) pile driving, potentially reducing impacts on in-water resources, including marine mammals, fish, and benthic communities. Alternative 2 considers construction of conventional sheet-pile bulkheads at Berths 11, 12, and 13 and a temporary circular, cellular sheet-pile cofferdam at the Dry Dock 3 caisson to create a dry workspace. Alternative 2 thus would require a greater number of piles and more pile-driving than Alternative 1. For this application, the Preferred Alternative (Alternative 1) has been modeled and analyzed. In the unlikely case that the Navy implements Alternative 2, actual impacts from noise would be worse than predicted in this application, and the Navy would initiate a new consultation with the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service.

Alternatives 1 and 2 are discussed in Chapter 2 of the EA, and general information on the construction processes for the proposed Berths 11, 12, and 13 structural repairs and Dry Dock 3 caisson replacement is provided in Appendix A of the EA.

Figure 1-2
Dry Docks, Berths, and the Portal Crane Rail System
Portsmouth Naval Shipyard
York County, Maine

Legend

- Dry Dock
- Berth
- Installation Area
- Portal Crane Rail

N

0 250 500 750 Feet

Source: ESRI 2013; Department of Defense 2014.

Path: \\prtbhp1\GIS\Buffalo\Portsmouth_Railway\Maps\MXD\Reports\IHA_Application\Figure_1-2_DryDocks_PortalCraneRailSystem.mxd 1/21/2016

This application focuses primarily on the in-water construction activities that will occur during the first year of construction, including completion of the king pile and concrete shutter panel bulkhead at Berth 11. Additional applications will be submitted for each subsequent year of in-water construction at Berths 11, 12, and 13. The preferred construction method for the Dry Dock 3 caisson replacement minimizes the extent and duration of in-water work and does not require pile-driving. Therefore, the Dry Dock 3 caisson replacement is not discussed further in this application. The general construction timeframes for both projects are provided in Table 1-1. It is important to note that these construction schedules are subject to change, depending on mission requirements and operational schedules at the affected dry docks and berths.

Table 1-1 Construction Timeframes for the Proposed Waterfront Improvement Projects

Project	Estimated Construction Start	Estimated Construction End
Berths 11, 12, and 13 Structural Repairs	October 2016	October 2022
Phase 1	*October 2016*	*June 2019*
In-Water Work - Phase 1 (Berth 11)	*January 2017*	*August 2018*
Phase 2	*October 2020*	*October 2022*
In-Water Work - Phase 2 (Berths 12 and 13)	*To be determined based on availability of berths*	*To be determined based on availability of berths*
Dry Dock 3 Caisson Replacement	February 2017	August 2018
In-Water Work – Outer Caisson Seat Repairs	*March 2017*	*July 2017*

Note: Due to mission requirements and operational schedules at the affected dry docks and berths, the general construction schedules above are subject to change.

1.3 Construction Methods and Descriptions

This section describes the typical methods of pile installation and extraction and dredging that would be used to accomplish the work included as part of this Proposed Action.

1.3.1 Pile Installation and Extraction with a Vibratory Hammer

Vibratory hammers are routinely used to install and extract smaller 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 produced during construction activities (ICF Jones and Strokes and Illingworth and Rodkin, Inc. 2012). However, they are considered a non-impulsive noise source as the hammer continuously drives the pile into the substrate; therefore, the total sound energy imparted can be comparable to impact driving. 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. The model of vibratory hammer likely to be used for the project is the MKT vibratory hammer. Piles installed with a vibratory hammer would include:

- 15-inch timber piles used to reconstruct timber dolphins at the corners of Berth 11
- 25-inch steel sheet piles used for the bulkhead at Berth 11

Extracted piles would include:

- 15-inch timber fender piles at Berth 11

- 15-inch timber piles making up the existing dolphins at the corner of Berth 11.

1.3.2 Pile Installation with an Impact Hammer

Impact hammers are the most common pile-driving method used to install piles of various sizes (ICF Jones and Strokes and Illingworth and Rodkin, Inc. 2012). 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 depend 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 depend on the energy of the strike and the pile size and composition. The model of impact hammer likely to be used for the project is the APE D36-26 impact hammer. Piles that would be installed through impact driving include 14-inch steel H-type piles used as sister piles at Berth 11 and to align and construct a temporary trestle support system during in-water construction at the berth

These piles must be installed with an impact hammer because the piles will not reach bearing depth or have the required load-bearing capacity if installed using vibratory methods only.

1.3.3 Drilling

Drilling is considered an intermittent, non-impulsive noise source, similar to vibratory pile driving. Very little information is available regarding source levels for in-water drilling activities associated with nearshore pile installation. Dazey et al. (2012) attempted to characterize the source levels of several marine pile-drilling activities. One such activity was auger drilling (including installation and removal of the associated steel casing). Due to a lack of information regarding pile-drilling source levels, it is generally assumed that drilling would produce less in-water noise than both impact and vibratory pile driving. Three drill models are likely to be used in different applications during in-water construction at Berth 11:

- The Bauer BG 24 rotary drill rig would be used to install king piles at Berth 11
- The SoilMec PSM-20 wet rotary drill rig would be used to install rock anchors to laterally support the bulkheads at the berth
- The Cassagrande M9 hydraulic rotary drill would be used to install micro piles at Berth 11C, if a bulkhead is not provided at this berth, to support a proposed utility tunnel.

1.3.4 Dredging

At the start of in-water construction, a level trench would be dredged along the footprint of the bulkhead. The dredged trench and the bottoms of the panels would be slightly lower than the Shipyard's permitted dredge depth at these berths to prevent the bottom of the bulkhead from being undermined during future maintenance dredging. At locations where a bedrock layer occurs above the permitted dredge depth, the panels would be installed slightly above the bedrock (MN-FST 2015). The model of the dredge that would be used would be determined by the construction contractor.

2 Dates, Duration, and Region of Activity

The date(s) and duration of such activity and the specific geographical region where it would occur.

2.1 Dates of Construction

In-water construction associated with the Proposed Action would occur in phases over a six-year construction period. In-water construction is scheduled to begin in January 2017 and be completed by October 2022. This application is for the first year of in-water construction, from January 1, 2017 to December 31, 2017. No seasonal limitations would be imposed on the construction timeline. Construction schedules for in-water work at Berth 11 are under development and subject to change based on operational requirements. Therefore, this IHA application covers all in-water construction planned for Berth 11 structural repairs. The Navy intends to apply for sequential IHAs to cover each of the subsequent years of construction.

2.2 Duration of Activities

Table 2-1 summarizes the in-water construction activities,—pile extraction, driving, and drilling, scheduled to take place during the timeframe covered by this IHA application. Note that pile- driving days are not necessarily consecutive. Also note that certain activities may occur at the same time, decreasing the total number of pile-driving days, thus making the total days described below a conservative estimate. Additional discussion follows below.

Table 2-1 Activity Summary for Year 1 of the Berths 11, 12, and 13 Structural Repairs

Activity/Method	Timing	Number of Days	Pile Type	Number of Piles Installed	Number of Piles Extracted
Extract timber piles/vibratory hammer	January 2017 to December 2017	10[1]	15-inch timber pile	-	77
Install temporary sister piles for trestle system/ vibratory hammer	January 2017 to December 2017	16[2]	14-inch steel H-type	64	-
Install permanent king piles for bulkhead/auger drilling	January 2017 to December 2017	10	36-inch steel H-type piles	94	-
Install steel sheet-pile bulkhead/vibratory hammer (sheet piles and sheet pile returns)	January 2017 to December 2017	6	24-inch steel sheet-piles	112	-
Install permanent sister piles/impact hammer	January 2017 to December 2017	13[2]	14-inch steel H-type	50	-
Install timber dolphin	January 2017 to January 2017	1[1]	15-inch timber piles	7	-

Table 2-1 Activity Summary for Year 1 of the Berths 11, 12, and 13 Structural Repairs

Activity/Method	Timing	Number of Days	Pile Type	Number of Piles Installed	Number of Piles Extracted
Extract temporary sister piles for trestle system/vibratory hammer	January 2017 to December 2017	16[2]	14-inch steel H-type	-	64
Totals		**72**		**327**	**141**

[1] Estimate based on assumption of 30 minutes to drive each pile and 30-minute transition and set up time, resulting in one pile per hour and eight piles per day (ICF Jones and Strokes and Illingworth and Rodkin, Inc. 2012).

[2] Estimate based on assumption of a one-hour transition and set up time, resulting in one pile per two hours and four piles per day (ICF Jones and Strokes and Illingworth and Rodkin, Inc. 2012).

Note: The Navy provided the following information in response to technical questions:

King Piles – estimate of 10 per day

Sheet piles- estimate of 20 per day, based on 20 piles in 8 hours (i.e., one day) because they will be installed two at a time

2.2.1 Pile-Driving, Extraction, and Drilling

The number of piles that can be driven per day varies for different project elements and is subject to change based on site conditions at the time.

Berth 11 (A, B, and C)

At the beginning of the in-water work, existing timber piles would be removed from the berth faces and the timber dolphin at the western end of the berth, and the contractor either would construct a temporary construction trestle or place a jack-up barge alongside the berths to provide additional construction workspace. Pile-driving and extraction would be needed to construct and disassemble the temporary construction trestle if the construction contractor selects this method over use of a jack-up barge, which would require no pile driving. The trestle system has been included in this analysis in order to model a conservative, worst-case scenario. If a jack-up barge is used instead of a trestle system, less pile driving will be needed, resulting in fewer marine mammal takes than predicted in this application.

For the proposed king pile and concrete shutter panel bulkhead (see Figures 2-1 and 2-2), the contractor would likely create templates and work in increments along the berth from the trestle or jack-up barge. For example, an approximately 50-foot-long template would allow installation of about 10 king piles and 20 sheet piles (along segments of the berths where sheet piles would be installed). The work would consist of setting a template (including temporary piles and horizontal members), which might take one or two days. Then the contractor would drill the rock sockets, which could take about one day per socket. King piles would be regularly spaced along the berths and grouted into sockets drilled into the bedrock (i.e., “rock-socketed”).

The concrete shutter panels would then be installed in stacks between the king piles along most of the length of Berth 11. Installation of the concrete piles is not included in the noise analysis because no pile driving would be required. Along an approximately 16-foot section at the eastern end of Berth 11A and an additional 101 feet between Berths 11A and 11B, the depth to bedrock is greater, thus allowing a conventional sheet-pile bulkhead to be constructed. The steel sheet-piles would be driven to bedrock using a vibratory hammer. Sheet piles installed with a vibratory hammer also would be used to construct “returns,” which would be shorter bulkheads connecting the new bulkheads to the existing bulkhead under the pier. Installation of the sheeting with a vibratory hammer is estimated to take less than one hour per pair of sheets. (the contractor would probably install two sheets at a time), and so the time required to

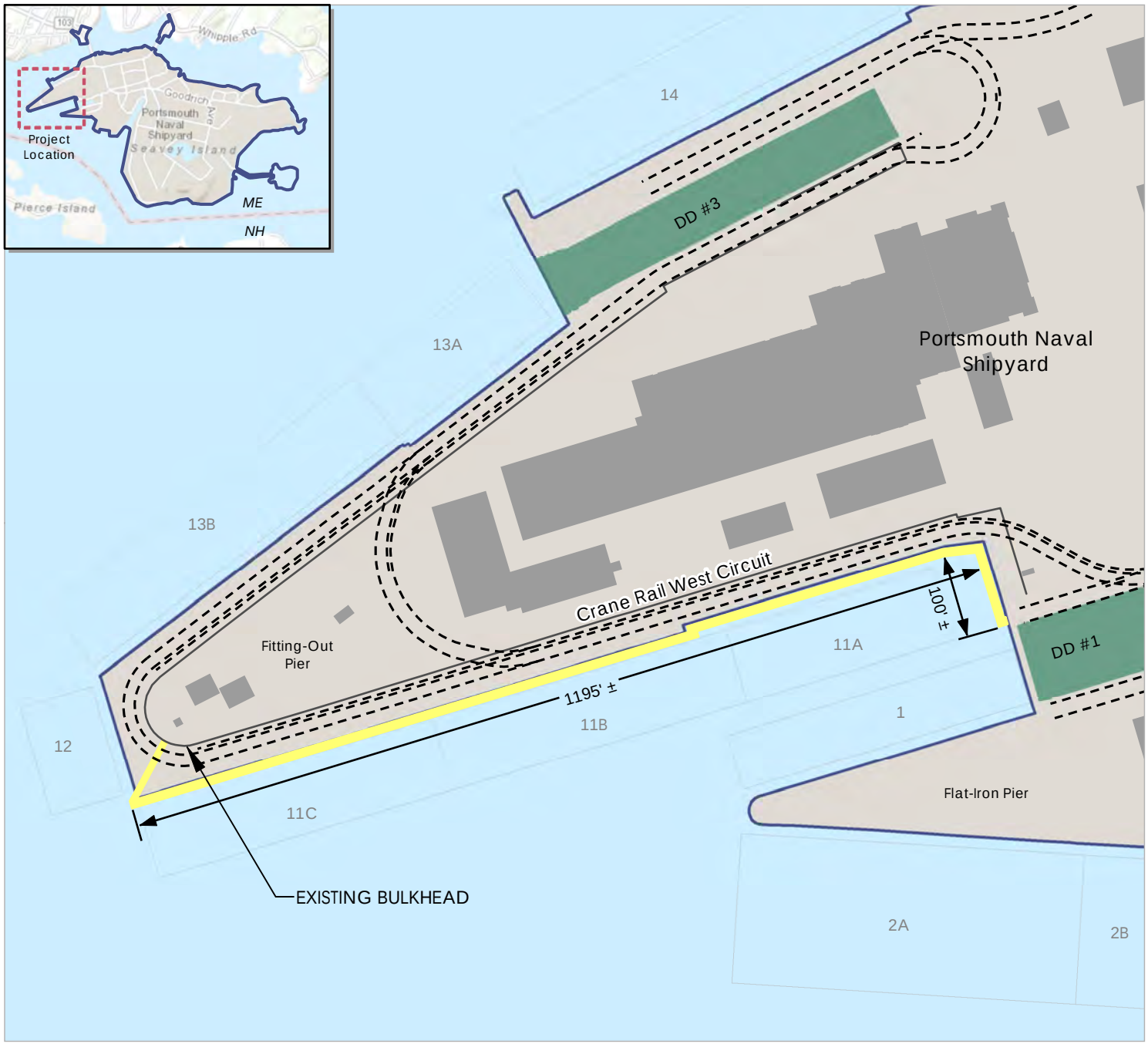

Figure 2-1
Berths 11 (A, B, and C) Bulkhead
Portsmouth Naval Shipyard
York County, Maine

Legend

- Proposed Bulkhead Phase 1
- Dry Dock
- Berth
- Existing Structures
- Installation Area
- Portal Crane Rail

N

0 100 200 300 400 Feet

Source: ESRI 2013; Department of Defense 2014.

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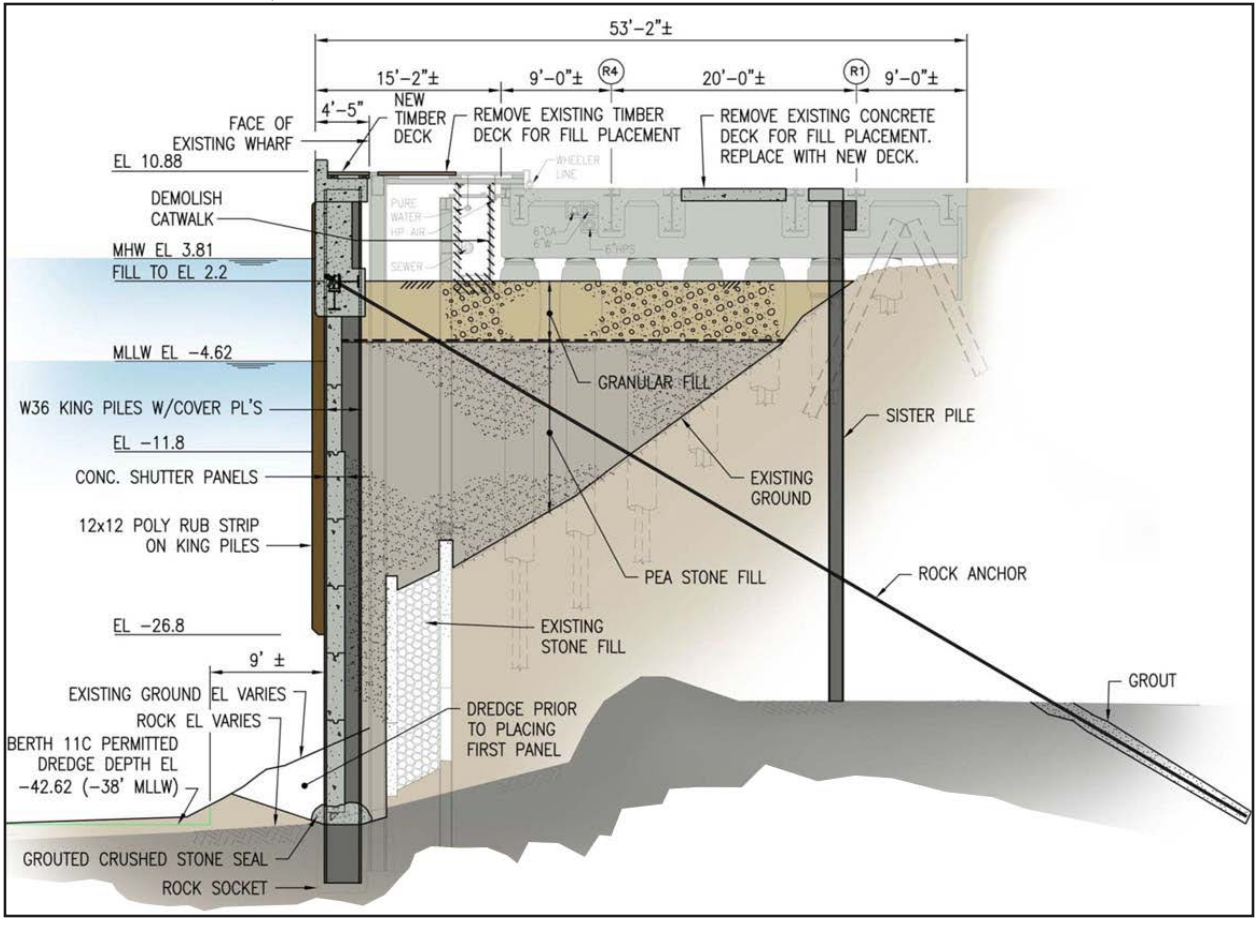

Figure 2-2
Berth 11 Bulkhead Conceptual Design
Portsmouth Naval Shipyard
York County, Maine

install the sheeting (10 pairs = 20 sheets) using vibratory hammers would only be about 8 hours per 10 pairs of sheets. Time requirements for all other pile types were estimated based on information compiled from ICF Jones and Strokes and Illingworth and Rodkin, Inc. (2012).

If sufficient construction funds are available, the Navy may install a king pile and concrete shutter panel bulkhead at Berth 11C as part of Phase 1. The bulkhead would extend from the western end of Berth 11B to the southern end of Berth 12. The in-water construction process would be the same as the process described above. The analysis in this application includes construction at Berth 11C. Once the Berth 11 bulkheads are complete, the timber dolphins at the western end of the berth would be replaced with a similar dolphin constructed of approximately seven piles.

Additional in-water work would be required to install steel H-type sister piles at the location of the inboard portal crane rail beam at Berth 11, including Berth 11C. The sister piles would provide additional support for the portal crane rail system and restore its load-bearing capacity. The sister piles would be driven into the bedrock below the pier, in water generally less than 10 feet deep, using an impact hammer. The timing of this work depends on operational schedules at the berths. The sister piles may be installed either before or after the bulkheads are constructed.

2.2.2 Dredging

Dredging would be completed in a continuous operation along the entire berth before any king-pile sockets are drilled in order to create the trench needed to seat the bulkhead. Dredging the bulkhead footprint at Berth 11 would take approximately two weeks.

2.3 Project Area Description

The Shipyard is located in the Piscataqua River in Kittery, Maine. The Piscataqua River originates at the boundary of Dover, New Hampshire, and Elliot, Maine. The river flows in a southeasterly direction for 13 miles before entering Portsmouth Harbor and then emptying into the Atlantic Ocean. The lower Piscataqua River is part of the Great Bay Estuary system and varies in width and depth. Many large and small islands break up the straight-line flow of the river as it continues toward the Atlantic Ocean. Seavey Island, the location of the Proposed Action, is located in the lower Piscataqua River approximately 547 yards from its southwest bank, 219 yards from its north bank, and approximately 2.5 miles from the mouth of the river.

2.3.1 Bathymetric Setting

Water depths in the Project area range from 21 feet to 39 feet at Berths 11, 12, and 13. Water depths in the lower Piscataqua River near the Project area range from 15 feet in the shallowest areas to 69 feet in the deepest areas. The river is approximately 3,300 feet wide near the Project area, measured from the Kittery shoreline north of Wattlebury Island to the Portsmouth shoreline west of Peirce Island. The furthest direct line of sight from the Project area would be 0.8 mile to the southeast and 0.26 mile to the northwest.

2.3.2 Tides, Circulation, Temperature, and Salinity

The tides in the Piscataqua River are semi-diurnal, with two high tides and two low tides per day. The tidal range between low and high tides in the Piscataqua River near Portsmouth Harbor is about 7 feet to 8 feet (NOAA n.d.). The tidal flow in the lower portion of the river is rather strong, with currents ranging from 5 to 10 knots (5.8 to 11. 5 miles per hour [mph]) (Garman and Harris 1995). Tidal waters from the Atlantic Ocean enter the Great Bay Estuary through the Portsmouth River mouth at high tide (Jones 2000), flooding the three major portions of the estuary, the Piscataqua River, Little Bay, and Great Bay. Recent efforts have begun to model the hydrodynamics and current flow patterns in the Great Bay estuary

as part of an effort to develop modeling capabilities for simulating hydrodynamic flows in estuaries with intertidal areas, but the Great Bay model has not yet been field-verified (Jones 2000).

Water temperature varies with season, ranging between 33 degrees Fahrenheit (°F) and 42°F in the winter/spring months, and between 48°F and 66°F in the summer/fall months (NERACOOS n.d.). The salinity in the vicinity of the Project area is considered that of sea water, 25 parts per thousand (ppt) and greater (NOAA November 1985).

2.3.3 Substrates and Habitats

Benthic sediments and substrates in the Project area were characterized during a benthic survey completed in May 2014 (CR Environmental, Inc. 2014). Surficial sediments were characterized using video transects and grab samples captured at five locations along Berths 11, 12, and 13. Sediment characteristics varied between the five locations. At the sample locations at both the north and south sides of the fitting-out pier (Berths 11 and 13), where the current was generally low energy, sediment consisted of soft mud, sand, pebbles, and old mussel shells. At the end of the pier (Berth 12), in an area of higher current flow, the substrate consisted of hard sand, pebbles/cobbles, and small boulders (CR Environmental, Inc. 2014).

Much of the shoreline in the Project area has been characterized as hard shores (rocky intertidal). In general, rocky intertidal areas consist of bedrock that alternates between marine and terrestrial habitats, depending on the tide (Department of the Navy 2013). Rocky intertidal areas are characterized by "bedrock, stones, or boulders that singly or in combination cover 75 percent or more of an area that is covered less than 30 percent by vegetation" (Navy 2013). The existing pier and hardened shoreline at the Shipyard provide substrate for the growth of algae and invertebrates.

2.3.4 Vessel Traffic and Ambient Underwater Soundscape

The lower Piscataqua River is home to Portsmouth Harbor and is used by commercial, recreational, and military vessels. Between 150 and 250 commercial shipping vessels transit the lower Piscataqua River each year (Magnusson et al. June 2012). The size of these vessels is limited by the 106-foot width of the river at the Sarah Long Bridge that spans the river (Magnusson et al. June 2012). Commercial fishing vessels are also very common in the river year round, as are recreational vessels, which are more common in the warmer summer months.

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).

Understanding the overall impact that the introduction of additional noise could have on the marine mammals present in the area requires knowing the background noise of an area. If background noise levels in the vicinity of the project exceed those of the NOAA Fisheries Service thresholds, i.e., 120 decibel (dB) or greater, then marine mammals would not be affected by any sound less than the existing dominant noise levels. For example, if the background noise levels average 140 dB, then additional sounds less than 140 dB would not expose animals to harassing levels of noise. Any sounds less than 140 dB would become part of the background noise level and would not be audible above the dominant background noise.

A recent ambient noise study conducted by ESS Group took in-water ambient sound pressure level measurements over the duration of a single day, November 25, 2014, at three locations at the Shipyard (one reading each at Berths 11, 12, and 13). Peak sound levels at Berth 11 reached a maximum instantaneous sound level of 79.7 L_{peak} dB re 1µPa, and the sound exposure level was 75.7 L_{sel} dB re 1µPa. Peak sound levels at Berth 12 reached a maximum instantaneous sound level of 103.9 L_{peak} dB re 1µPa, and sound exposure level was 80.5 L_{sel} dB re 1µPa. Peak sound levels at Berth 13 reached a maximum instantaneous sound level of 91.7 L_{peak} dB re 1µPa, and sound exposure level was 52.8 L_{sel} dB re 1µPa. However, boat traffic was limited the day of the study; three boats passed at a distance greater than 66 yards from site. Therefore, given the short duration of the measurements, it would be difficult to determine whether vessel noise associated with the Proposed Action would add greatly to the existing background vessel noise in the lower Piscataqua River. However, based on these measurements, it cannot be assumed that the sound produced by vibratory pile driving would be completely masked by background vessel noise, especially in areas close to the vibratory hammer.

2.3.5 Existing Airborne Noise

The Shipyard is a dynamic industrial facility situated on an island with a narrow separation of waterways between the installation and the communities of Kittery and Portsmouth. The predominant noise sources from Shipyard industrial operations consist of dry dock cranes; passing vessels; and industrial equipment (e.g., forklifts, loaders, rigs, vacuums, fans, dust collectors, blower belts, heating, air conditioning, and ventilation [HVAC] units, water pumps, and exhaust tubes and lids). Other components such as construction, vessel ground support equipment for maintenance purposes, vessel traffic across the Piscataqua River, and vehicle traffic on the Shipyard's bridges and on local roads in Kittery and Portsmouth produce noise, but such noise generally represents a transitory contribution to the average noise level environment (Blue Ridge Research and Consulting [BRRC] 2015; ESS Group 2014).

Ambient sound levels recorded at the Shipyard are considered typical of a large outdoor industrial facility and vary widely in space and time (ESS Group 2015. Table 2-2 summarizes in-air sound exposure and the average ambient sound levels recorded at Berth 11 in 2014 during normal operations (morning and afternoon hours), as well as the predominant operational and natural sound sources identified. Note that these levels are referenced to 20 µPa, the appropriate reference for in-air sound measurements. They differ from most of the sound levels that will appear in the rest of the document, which are referenced to 1 µPa, the appropriate reference for in-water sound measurements.

Table 2-2 Ambient Sound Levels Recorded at Berths 11, 12, and 13

Measurement Location	Sound Exposure Level (SEL) dBA re 20 µPa)		Equivalent Sound Level (L_{eq} dBA re 20 µPa)		Predominant sources
	Morning	Afternoon	Morning	Afternoon	
Berth 11	100.4	94.0	69.6	63.2	Operational sources: trucks and forklifts passing, drilling rig, circular saw noise, passing boats, front-end loaders passing. Natural sources: wind noise and seagulls

Source: ESS Group 2014; BRRC 2015.

Key:
dBA = A-weighted decibel.
L_{eq} = Equivalent sound level. L_{eq} is the continuous sound level that would be present if all of the variations in sound occurring over a specified time period had the same total sound energy. It correlates reasonably well with the effects of noise on people, even for wide variations in environmental sound levels and time patterns.
SEL = Sound exposure level. It provides a measure of total sound energy of an acoustic event. It is commonly used for describing sound from passing vehicles.

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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.

Five marine mammal species, including one cetacean and four pinnipeds, may inhabit or transit the waters near the Shipyard in the lower Piscataqua River. These include the harbor porpoise (*Phocoena phocoena*), grey seal (*Halichoerus grypus*), harbor seal (*Phoca vitulina*), hooded seal (*Crystphora cristata*), and harp seal (*Pagophilus groenlandicus*). None of the marine mammals that may be found in the Piscataqua River are listed under the Endangered Species Act (ESA). All marine mammal species are protected under the Marine Mammal Protection Act (MMPA). Section 3 summarizes the population status and abundance of these species, while Section 4 contains detailed life history information for each. Table 3-1 lists the marine mammal species that could occur in the vicinity of the Shipyard and their estimated densities within the Project area. As there are not specific density data for any of the species in the Piscataqua River, density data from the nearshore zone outside the mouth the Piscataqua River in the Atlantic Ocean have been used instead. Therefore, it can be assumed that the density estimates presented here for each species are conservative and much higher than densities that would typically be expected in an estuarine environment such as the lower Piscataqua River in the vicinity of the Shipyard.

Table 3-1 Marine Mammal Species Potentially Present in the Piscataqua River in the Vicinity of the Shipyard

Species	Stock(s) Abundance(1)	Relative Occurrence in Piscataqua River	Season(s) of Occurrence	Approximate Density in the Vicinity of the Project Area (individuals per km^2)(3)			
				Winter	Spring	Summer	Fall
Harbor Porpoise *Phocoena phocoena* Gulf of Maine/Bay of Fundy stock	79,883 (CV= 0.32)	Occasional use	Spring to Fall (April to December)[4]	1.2122	1.1705	0.7903	0.9125
Grey Seal *Halichoerus grypus* Western North Atlantic stock	331,000(2)	Common	Year-round	0.2202	0.2202	0.2202	0.2202
Harbor Seal *Phoca vitulina* Western North Atlantic stock	70,142 (CV= 0.29)	Common	Year-round	0.1998	0.1998	0.1998	0.1998
Hooded Seal *Crystphora cristata* Western North Atlantic stock	592,900(2)	Rare	Winter to Spring (January – May)	N/A	N/A	N/A	N/A

Table 3-1 Marine Mammal Species Potentially Present in the Piscataqua River in the Vicinity of the Shipyard

Species	Stock(s) Abundance[1]	Relative Occurrence in Piscataqua River	Season(s) of Occurrence	Approximate Density in the Vicinity of the Project Area (individuals per km^2)[3]			
				Winter	Spring	Summer	Fall
Harp Seal *Pagophilus groenlandicus* Western North Atlantic stock	71,000,000	Rare	Winter to Spring (January – May)	0.0125	0.0125	0.0125	0.0125

Source: Waring et al. 2014, except where noted.

Notes:
(1) No population estimate is available for the U.S. western North Atlantic stock; therefore, the best population estimates are those for the Canadian populations as reported in Waring et al. 2014.
(2) Source: Waring et al. 2007. The population estimate for the Western North Atlantic hooded seal population was not updated in Waring et al. 2014.
(3) Density data are taken from the Navy Marine Species Density Database (Crain 2015; Krause 2015). It should be noted that these data overestimate the potential species density in the Piscataqua River. The Navy Marine Species Density Database data presented in the table are based on a relative environmental suitability study and represent data with low confidence. These data are generally used for broad-scale offshore activities; however, due to a lack of any other data within the general Project area, these data are presented as the best available data for the Piscataqua River.
(4) Densities shown for seasons when each species would not be likely to occur in the river

Key:
CV = coefficient of variation
km^2 = square kilometer

3.1 Species Descriptions and Abundances

3.1.1 Harbor Porpoise

Species Description

The harbor porpoise is a member of the *Phocoenidae* family. Adult harbor porpoises range from 5 to 5.5 feet in length and can weigh up to 170 pounds. They are a toothed whale species and can be recognized by their small, robust, dark gray body with greyish-white sides, triangular dorsal fin, and short rostrum. Harbor porpoises are considered sexually dimorphic, with females being slightly larger than males (NOAA Fisheries Service 2014a).

Harbor porpoises are found commonly in coastal and offshore waters of both the Atlantic and Pacific Oceans. In the western North Atlantic, the species is found in both U.S. and Canadian waters. More specifically, the species can be found between West Greenland and Cape Hatteras, North Carolina (NOAA Fisheries Service 2014a). 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. For management purposes in U.S. waters, harbor porpoises have been divided into 10 stocks along both the East and West Coasts. Of those 10 stocks, only one, the Gulf of Maine/Bay of Fundy stock, is found along the U.S. East Coast, and thus only individuals from this stock could be found in the Project area. The species is primarily found over the Continental Shelf in waters less than approximately 500 feet deep (Waring et al. 2014). In general, the species is commonly found in bays, estuaries, and harbors (NOAA Fisheries Service 2014a).

Population Abundance

Line-transect surveys have been conducted in the Gulf of Maine between 1991 and 2011. Based on the 2011 aerial surveys, the best abundance estimate for the Gulf of Maine/Bay of Fundy stock of harbor porpoise is 79,883 animals (CV=0.32). The aerial surveys included central Virginia to the lower Bay of Fundy. The minimum population estimate is 61,415 animals (Waring et al. 2014). Because no trend analysis has been conducted for this stock, no population trend is available. A Bayesian population model was used to determine the currently accepted population growth rate. Fertility data and age-at-death data from stranded animals and animals taken in gillnets were used for the model (Waring et al. 2014). It was then determined that the potential natural growth rate for the Gulf of Maine/Bay of Fundy stock of harbor porpoises was 0.046 (Waring et al. 2014). The harbor porpoise is likely the most abundant cetacean within the Piscataqua River (Smith n.d.).

3.1.2 Grey Seal

Species Description

Grey seals, which are 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 feet to capture prey during feeding (NOAA Fisheries Service 2013). Grey seals primarily feed on fish, squid, various crustacean species, and octopus. Adult grey seals are sexually dimorphic, with males generally being larger than females. Adult males can reach up to 10 feet in length and weigh up to 880 pounds (NOAA Fisheries Service 2013). Adult females can reach up to 7.5 feet in length and can weigh up to 550 pounds (NOAA Fisheries Service 2013). As a true seal, this species lacks external ear flaps, and its rear flippers do not rotate. Depending on its geographic location and sex, grey seal appearance and coloration varies. Adult females have a silver-grey 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 Service 2013).

Grey seals can be found on both sides of the North Atlantic. Within this area, the species is split into three primary populations: 1) eastern Canada, 2) northwestern Europe, and 3) the Baltic Sea (Katona et al. 1993). Grey seals within U.S. waters are considered the western North Atlantic stock and are expected to be part of the eastern Canadian population (Waring et al. 2014). In U.S. waters, year-round breeding of approximately 400 animals has been documented on areas of outer Cape Cod and Mukeget Island in Massachusetts. In general, this species can be found year-round in the coastal waters of the Gulf of Maine (Waring et al. 2014).

Population Abundance

There are currently no population estimates for the western North Atlantic grey seal stock (Waring et al. 2014). However, estimates are available for portions of the total population for certain time periods (Waring et al. 2014). For example, between 1993 and 2004, the grey seal population in Canada was estimated at between 144,000 and 223,220 individuals. This estimate was based on three separate surveys and also depended on the population-estimation model that was used (Mohn and Bowen 1996; Department of Fisheries and Oceans 2003; Trzcinski et al. 2005). The most recent Canadian grey seal population estimate is 331,000. This estimate is based on surveys conducted during 2012 in the Gulf of St. Lawrence, Nova Scotia Eastern Shore, and Sable Island (Waring et al. 2014). In U.S. waters, grey seals are known to pup at three separate locations: 1) Muskeget Island, Massachusetts; 2) Green Island, Maine; and 3) Seal Island, Maine. Surveys of these areas indicate that in these colonies pup production is increasing, as are the colony populations. General population increases in U.S. waters are likely a result of this natural increase and immigration of individuals from Canadian populations (Waring et al. 2014).

3.1.3 Harbor Seal

Species Description

Harbor seals are also members of the true seal family (*Phocidae*) and can be found in nearshore waters along both the North Atlantic and North Pacific coasts, generally at latitudes above 30°N (Burns 2009). In the western Atlantic Ocean, the harbor seal's range extends from the eastern Canadian Arctic to New York; however, they can be found as far south as the Carolinas (Waring et al. 2014). In New England, the species can be found in coastal waters year-round (Waring et al. 2014). Overall, there are five recognized subspecies of harbor seal, two of which occur in the Atlantic Ocean. The western Atlantic harbor seal (*Phoca vitulina concolor*) is the subspecies likely to occur in the 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).

Similar to grey seals, adult harbor seals are sexually dimorphic. Males are generally larger than females. Adult harbor seals can reach up to 6.3 feet in length and weigh up to 245 pounds (NOAA Fisheries Service 2014c). As with other members of the *Phocidae* family, 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 Service 2014c).

Population Abundance

An aerial abundance survey was conducted in 2012 during the pupping season along the entire Maine coast. As a result of this survey, the best estimate of abundance for the western North Atlantic stock of harbor seal was 70,142 animals. The minimum population was estimated as 55,409 animals (also based on the 2012 aerial abundance survey). No trend analysis has been conducted for this species, likely because of the long interval between the 2012 survey and the previous 2001 survey and the somewhat imprecise abundance estimates that were generated from them. In the Piscataqua River, harbor seals are the most abundant pinniped species (Smith n.d.).

3.1.4 Hooded Seal

Species Description

Hooded seals are also members of the true seal family (*Phocidae*) and are generally found in deeper waters or on drifting pack ice. 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 (Waring et al. 2007). The hooded seal is a highly migratory species, and its range can extend from the Canadian arctic to Puerto Rico. In U.S. waters, the species has an increasing presence in the coastal waters between Maine and Florida (Waring et al. 2007). In the U.S., they are considered members of the western North Atlantic stock and generally occur in New England waters from January through May and further south in the summer and fall seasons (Waring et al. 2007).

Similar to both the grey seal and harbor seal, hooded seals are also sexually dimorphic. Males are generally much larger than females, reaching up to 8 feet in length and weighing approximately 660 pounds (NOAA Fisheries Service 2012b). Females generally reach up to 7 feet in length and weigh up to 440 pounds (NOAA Fisheries Service 2012b). Adult hooded seals are a silver-gray color with dark marks in varying sizes and shapes on their coats. They also have a distinctive block-shaped head. As with other true seal species, hooded seals lack external ear flaps, and their rear flippers do not rotate (NOAA Fisheries Service 2012b).

Population Abundance

Population abundance of hooded seals in the western North Atlantic is derived from pup production estimates. These estimates are developed from whelping pack surveys. The most recent population estimate in the western North Atlantic was derived in 2005. There have been no recent surveys conducted or population estimates developed for this species. The 2005 best population estimate for hooded seals is 592,100 individuals, with a minimum population estimate of 512,000 individuals (Waring et al. 2007). Currently, not enough data are available to determine what percentage of this estimate may represent the population within U.S. waters. A population trend also cannot be developed for this species due to a lack of sufficient data. Hooded seals are known to occur in the Piscataqua River; however, they are not as abundant as the more commonly observed harbor seal. Anecdotal sighting information indicates that two hooded seals were observed from the Shipyard in August 2009, but no other observations have been recorded (Trefry November 20, 2015).

3.1.5 Harp Seal

Species Description

Harp seals are also members of the true seal familclassified into three stocks, which coincide with specific pupping sites on pack ice, 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 (Waring et al. 2014). The hooded 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 (Waring et al. 2014). In the U.S., they are considered members of the western North Atlantic stock and generally occur in New England waters from January through May in the winter and spring (Waring et al. 2014). The observed influx of harp seals and geographic distribution in New England to mid-Atlantic waters is based primarily on strandings and secondarily on fishery bycatch.

Unlike the grey seal, harbor seal, and hooded seal, harp seals exhibit little sexual dimorphism. Males are generally only slightly larger than females, reaching up to 6’3” in length and weighing approximately 310 pounds (Reeves et al. 2002). Females generally reach up to 5’11” in length and weigh up to 290 pounds (Reeves et al. 2002). 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, hooded seals lack external ear flaps, and their rear flippers do not rotate (NOAA Fisheries Service 2015).

Population Abundance

Population abundance of harp seals in the western North Atlantic is derived from aerial surveys and mark-recapture (Waring et al. 2014). The most recent population estimate in the western North Atlantic was derived in 2012 from an aerial harp seal survey. The 2012 best population estimate for hooded seals is 7.1 million individuals (Waring et al. 2014). Currently, not enough data are available to determine what percentage of this estimate may represent the population within U.S. waters. A population trend also cannot be developed for this species due to a lack of sufficient data, as recent increases in strandings may not be indicative of population size. Harp seals are known to occur in the Piscataqua River; however, they are not as abundant as the more commonly observed harbor seal (Crain 2015).

3.1.6 Species Considered But Not Included in Analysis

Bottlenose Dolphin (*Tursiops truncatus*)

The western North Atlantic northern migratory stock of bottlenose dolphin (*Tursiops truncates*) can be found between Long Island, New York, and Cape Hatteras, North Carolina, during summer months (July

through September) (Cetacean and Turtle Assessment Program [CeTAP] 1982). During winter months, dolphins from this stock are rarely seen north of the North Carolina/Virginia border (Waring et al. 2014). Consequently, the range of this dolphin is well outside of the Project area. The estimated density of this species in the lower Piscataqua River reflects its rarity, with estimated densities ranging from 0.0664 to 0.1439 individuals per square kilometer (km^2) for fall and summer (Crain 2015; Krause 2015). Based on the known occurrence of this species in warmer southern waters during the winter months and rare occurrence within the lower Piscataqua River during summer months, it is not expected that the Atlantic white-sided dolphin would occur within the vicinity of the Project area during the in-water construction period. Bottlenose dolphins are not listed as threatened or endangered under the ESA, and the western North Atlantic northern stock is not considered strategic under the MMPA. Because the occurrence of this species in the Project area is predicted to be rare, the potential for bottlenose dolphin takes are not analyzed in this application.

Atlantic White-sided dolphin (*Lagenorhynchus acutus)*

Atlantic white-sided dolphins (*Lagenorhynchus acutus*) of the western North Atlantic stock inhabit waters from central west Greenland to North Carolina and as far east as the Mid-Atlantic ridge (Hamazaki 2002; Doksaeter et al. 2008; Waring et al. 2008). While members of Western North Atlantic stock of this dolphin do inhabit the Gulf of Maine, they are most common between Hudson Canyon and Georges Bank, which is approximately 70 miles (113 km) offshore of the Project area (Waring et al. 2014). Based on the known occurrence of this species in New England offshore waters east and north of the Project area during the spring, summer, and fall months, and their overall lack of presence throughout the region during winter months, it is not expected that the Atlantic white-sided dolphin would occur within the vicinity of the Project during the in-water construction period. White-sided dolphins are not listed as threatened or endangered under the ESA, and the Western North Atlantic stock is not considered strategic under the MMPA. As the occurrence of this species in the Project area is predicted to be rare, the potential for white-sided dolphin takes are not analyzed in this application.

3.2 Spatial Distribution

Density assumes that marine mammals are uniformly distributed within a given area, although this is rarely the case. Marine mammals are usually concentrated in areas of greater importance--for example, areas of high productivity, lower predation, safe calving, and prime foraging. Density can occasionally be calculated for smaller areas that are used regularly by marine mammals, but more often than not scientific data are insufficient to represent the spatial distribution of animals for small regions such as the construction area encompassed by the Project. Therefore, given the lack of availability of specific marine mammal data for the Portsmouth Naval Shipyard, this IHA application assumes that marine mammals are uniformly distributed in the study area.

3.3 Submergence

Cetaceans spend their entire lives in the water and spend most of their time (more 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.

Seals and sea lions (pinnipeds) spend significant amounts of time out of the water during breeding, molting, and "hauling out" (resting out of the water on land or marine structures) periods. When not actively diving, pinnipeds at the surface often orient their bodies vertically in the water column and often hold their heads above the water surface. Consequently, pinnipeds may not be exposed to underwater sounds to the same extent as cetaceans occurring in the same location.

For the purpose of assessing impacts from underwater sound at the Shipyard, the Navy assumed that that both cetaceans and pinnipeds that occur in the vicinity would be submerged 100 percent of the time. This approach could be considered conservative because seals spend a portion of their time hauled out, and the closest known haul-out site for seals within the Piscataqua River is 1.5 miles downstream of the Project area. Therefore, seals are expected to be exposed to less sound than is estimated by this approach.

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4 Status and Distribution of Marine Mammal Species or Stock that Could Potentially be Affected

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.

Five marine mammal species could occur within the waters adjacent to the Shipyard with confirmed or historic occurrence in the Project area. None of these species are listed under the ESA. The population status, distribution, behavior and ecology, and acoustics (uses of sound and hearing ability) of each species are described below. Background on acoustics and definitions of metrics are provided in Section 6 of this document.

4.1 Harbor Porpoise, Gulf of Maine/Bay of Fundy Stock

4.1.1 Population Status

The Gulf of Maine/Bay of Fundy stock of the harbor porpoise is not categorized as depleted under the MMPA. The stock is considered a strategic stock as a result of the estimated average annual human-related mortality exceeding the potential biological removal for this stock.

4.1.2 Distribution

The Gulf of Maine/Bay of Fundy stock of the harbor porpoise is generally found over the Continental Shelf, ranging from the Gulf of Maine/Bay of Fundy region to North Carolina, in varying abundance and depending on the season (Waring et al. 2014). July through September are the primary months this species can be found in the Gulf of Maine and the southern Bay of Fundy area (Waring et al. 2014). During this time, harbor porpoises are generally found in less than approximately 500 feet of water (Waring et al. 2014). During other times of year, this species is more dispersed throughout a larger region that includes Maine though New Jersey. Harbor porpoises are primarily found throughout this area during the fall months (October through December) and spring months (April through June) (Waring et al. 2014). During winter months (January through March), harbor porpoises are generally found in much lower densities between New York and Canada, as well as dispersed between New Jersey and North Carolina (Waring et al. 2014; CeTAP 1982). At this time, there has been no research that supports either a migration triggered by water temperature or a specific migration route through the species' range. Harbor porpoises are known to occur in the Piscataqua River and are the most commonly observed cetacean species for the river (Smith n.d.).

4.1.3 Behavior and Ecology

Harbor porpoises feed individually, with their primary prey consisting of demersal and benthic species such as schooling fish and cephalopods (Reeves et al. 2002; NOAA Fisheries Service 2014a). In the Bay of Fundy, harbor porpoises feed on Atlantic herring (*Clupea harengus*) during the summer months (Gannon et al. 1997). During fall months in the Gulf of Maine, harbor porpoises also primarily feed on Atlantic herring, along with silver hake (*Merluccius bilinearis*), red hake (*Urophycis chuss*), white hake *(Urophycis tenuis*), and pearlside (*Maurolicus pennanti*) (Gannon et al 1997). Harbor porpoises are most commonly found in bays, estuaries, and harbors and are generally solitary animals, usually observed either alone or in small groups (NOAA Fisheries Service 2014a; Reeves et al. 2002). The species in highly mobile, and individuals can travel many miles in one day within home ranges of thousands of square miles (Reeves et al. 2002). Harbor seals generally do not approach human activities and tend to be hard to follow because they spend little time at the surface. In the Gulf of Maine, a main issue of concern with this species is interaction with the gillnet fishery. As harbor porpoises commonly feed on small,

schooling fish, such as those targeted by gillnets, they often become entangled in these nets when pursuing prey (NOAA Fisheries Service January 2010).

4.1.4 Acoustics

Harbor porpoises are considered high-frequency cetaceans, along with 19 other species and subspecies. In general, the estimated bandwidth for functional hearing in high-frequency cetaceans is 200 hertz (Hz) to 180 kilohertz (kHz) (Southall et al. 2007). Hearing capabilities for harbor porpoises have been tested both behaviorally and with the auditory evoked potential technique. Based on an audiogram developed from behavioral methods, detection thresholds were estimated between 250 Hz and 180 kHz. Within that, the range of best hearing was from 16 to 140 kHz, and maximum sensitivity was recorded at 100 to 140 kHz (Kastelein et al. 2002). Harbor porpoises are vocal animals, using echolocation for feeding and navigation and vocalizing for socialization (Southall et al. 2007).

4.2 Grey Seal, Western North Atlantic Stock

4.2.1 Population Status

The western North Atlantic stock of the grey seal is not categorized as strategic or depleted under the MMPA.

4.2.2 Distribution

The general range of the western North Atlantic stock of the grey seal is between New York and Labrador, Canada (Katona et al. 1993; Lesage and Hammill 2001). The western North Atlantic Ocean hosts three breeding colonies: 1) Sable Island; 2) Gulf of St. Lawrence; and 3) the coast of Nova Scotia (Laviguer and Hammill 1993 in Waring et al. 2014). No known haul-out sites for grey seals are in the immediate vicinity of the Project area. The closest known haul-out site for seals within the Piscataqua River is 1.5 miles downstream of the Project area. In coastal Maine, grey seals are known to pup on Green Island and Sea Island and are year-round residents in southern Maine waters (Waring et al. 2014). Grey seals are known to occur within the Piscataqua River but are not as commonly observed as harbor seals (Smith n.d.). During spring and summer months, grey seals are most commonly observed on offshore ledges off the central coast of Maine (Richardson et al. 1995).

4.2.3 Behavior and Ecology

Grey seals gather in large groups (often several hundred animals or more) for breeding, molting and resting. However, they are assumed to be solitary feeders, with some foraging in waters close to their haul-out colonies, while others travel great distances away from their colonies (Reeves et al. 2002). Foraging grey seals can remain at sea for up to 20 days (Reeves et al. 2002). Grey seals are opportunistic feeders whose primary food resources include fish, squid, various crustacean species, and octopus (NOAA Fisheries Service 2013). They can also dive deep (up to 1,560 feet) to capture prey when necessary (NOAA Fisheries Service 2013). Grey seals pups are generally born between January and February in the western Atlantic Ocean, and breeding rookeries generally consist of beaches, rocky islands, coasts, caves, and ice floes (NOAA Fisheries Service 2013).

4.2.4 Acoustics

Grey seals, along with other members of the *Phocididae* family, are capable of hearing in both air and water. In general, the estimated bandwidth for functional hearing for phocids in water is 75 Hz to 75 kHz and in air is 75 Hz to 30 kHz (Southall et al. 2007). Phocids, and pinnipeds in general, are also known to produce a wide variety of low-frequency social sounds, with varying hearing capabilities in air and in water (Southall et al. 2007). Hearing capabilities for grey seals both in water and in air have been tested behaviorally and with the auditory evoked potential technique (Southall et al. 2007).

4.3 Harbor Seal, Western North Atlantic Stock

4.3.1 Population Status

The western North Atlantic stock of harbor seal is not categorized as strategic or depleted under the MMPA.

4.3.2 Distribution

The western North Atlantic stock of harbor seal is primarily found along the coastal and inshore regions of the northeastern U.S. and Canada. The species primarily occupies bays, estuaries, and inlets and is rarely observed more than 7.7 miles from shore (Baird 2001). Harbor seals are also often found upstream in coastal rivers (Baird 2001). The greatest concentrations within this region occur in coastal Maine, where they reside year-round (Katona et al. 1993; Waring et al. 2014). In the western North Atlantic, the harbor seal is distributed from the eastern Canadian Arctic and Greenland south to the southern extent of New England and New York State, with more recent occurrences in Virginia and the Carolinas (Mansfield 1967; Baird 2001). While technically year round residents, harbor seals generally migrate out of Canadian and Maine waters toward southern New England during fall and early winter. This is followed by a northward movement back into Maine waters prior to the pupping season, which occurs between mid-May and June (Waring et al. 2014). Harbor seals are known to occur in the Piscataqua River and are the most commonly observed pinniped species for the river (Smith, n.d.). No known haul-out sites for harbor seals are in the immediate vicinity of the Project area, with the closest known haul-out site for seals within the Piscataqua River being 1.5 miles downstream from the Project area.

4.3.3 Behavior and Ecology

Harbor seals gather in large groups of several hundred seals during molting season on sandy or cobble beaches or tidal sand bars (Reeves et al. 2002). While at sea, however, they are solitary and can spend up to several weeks at sea foraging. Harbor seals' diet varies greatly. They feed on demersal fish, pelagic schooling fish, octopus, and squid, and their diet largely depends on what is available (Reeves et al.2002). In New England waters, harbor seals feed primarily on sandlance (*Ammodytidae*), silver hake, Atlantic herring, and redfish (*Sebastes fasciatus*). Other prey species include cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), pollock (*Pollachius virens*), flounders (*Plueronectidae*), mackerel (*Scomber Scomrus*), and squid. While feeding, harbor seals spend 85 percent of their time diving, sometimes reaching depths of up to 500 feet.

In general, harbor seals mate at sea, and females give live birth during the spring and summer; however, the pupping season varies by latitude. Along the Maine coast, pupping season generally occurs from mid-May through June (Kenney 1994 in Waring et al. 2014; deHart 2002 in Waring et al. 2014) and to a much lesser extent at high-use haul-out sites off of Manomet, Massachusetts (Waring et al. 2014).

4.3.4 Acoustics

Harbor seals (similar to grey seals and other phocid seals), are capable of hearing in both air and water. In general, the estimated bandwidth for functional hearing for phocid seals in water is 75 Hz to 75 kHz and in air is 75 Hz to 30 kHz (Southall et al. 2007). In air, harbor seal males produce a variety of low-frequency (<4 kHz) vocalizations, including snorts, grunts, and growls. Male harbor seals produce communication sounds in the frequency range of 100 to 1,000 Hz (Richardson et al. 1995). Harbor seals hear nearly as well in air as underwater (Kastak and Schusterman 1998). Kastak and Schusterman (1998) reported airborne low-frequency (100 Hz) sound detection thresholds at 65.4 dB re 20 μPa for harbor seals. In air, they hear frequencies from 0.25 kHz to 30 kHz and are most sensitive to frequencies from 6 to 16 kHz (Richardson et al. 1995; Terhune and Turnbull 1995; Wolski et al. 2003).

Adult males also produce underwater sounds during the breeding season that typically range from 0.025 to 4 kHz at a duration range of 0.1 second to multiple seconds (Hanggi and Schusterman 1994). Hanggi and Schusteman (1994) found that there is individual variation in the dominant frequency range of sounds between different males, and Van Parijs et al. (2003) reported oceanic, regional, population, and site-specific variation that could be vocal dialects. In water, the species hears frequencies from 1 to 75 kHz (Southall 2007) and can detect sound levels as weak as 60 to 85 dB re 1 μPa within that band. They are most sensitive at frequencies below 50 kHz; above 60 kHz, sensitivity rapidly decreases.

4.4 Hooded Seal, Western North Atlantic Stock

4.4.1 Population Status

The western North Atlantic stock of the hooded seal is not categorized as strategic or depleted under the MMPA.

4.4.2 Distribution

Hooded seals generally inhabit the Arctic Ocean and northern Atlantic Ocean. The western Atlantic stock is known to whelp in three locations off Canada's east coast: 1) the area off the coast of Newfoundland and Labrador (the Front herd); 2) the Gulf of St. Lawrence (the Gulf herd); and 3) the Davis Strait (Waring et al. 2007). Hooded seals are observed within New England waters between January and May (Waring et al. 2007). Molting occurs between June and August in the Denmark Strait in Greenland. After this, they disperse widely (Waring et al. 2007). Breeding then occurs in February at the three whelping locations. Hooded seals are known to occur in the Piscataqua River; however, they are not as abundant as the more commonly observed harbor seal (Smith n.d.).

4.4.3 Behavior and Ecology

With the exception of breeding and molting, hooded seals are primarily solitary (Reeves et al. 2002). Both males and females are aggressive during mating season and often vocalize loudly while on the ice. Breeding generally occurs in aggregations on pack ice (Reeves et al. 2002). Hooded seals feed primarily on squid and fish, particularly cod and redfish; however, they also feed on crustaceans, starfish, and mussels (Reeves et al. 2002; NOAA Fisheries Service 2012b). Hooded seals are deep divers and usually dive to depths of 325 to 1,900 feet for up to 15 minutes (NOAA Fisheries Service 2012b). There is no information on hooded seal behavior in the Piscataqua River.

4.4.4 Acoustics

Along with other pinniped species and subspecies, hooded seals are capable of hearing in both air and water. Hearing capabilities of this species have not been directly tested as they have for other species. However, as hooded seals are within the *Phocididae* family, the functional hearing limit of these is species is expected to be similar to that of other phocid seals. In general, the estimated bandwidth for functional hearing for phocids in water is 75 hertz (Hz) to 75 kHz and in air is 75 Hz to 30 kHz (Southall et al. 2007). Pinnipeds in general are also known to produce a wide variety of low-frequency social sounds, with varying hearing capabilities in air and in water (Southall et al. 2007).

4.5 Harp Seal, Western North Atlantic Stock

4.5.1 Population Status

The western North Atlantic stock of the harp seal is not categorizedunder the MMPA as strategic or depleted(Waring et al. 2014).

4.5.2 Distribution

Harp seals generally inhabit the Arctic Ocean and northern Atlantic Ocean. The western Atlantic stock is known to whelp in three locations off Canada's east coast: 1) Eastern Canada, including tareas 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 (Waring et al. 2014). Harp seals are observed within New England waters between January and May (Waring et al. 2014). Breeding occurs at different times at each whelping location, but generally between late-February and April. Adults then assemble on suitable pack ice to undergo the annual molt, after which they migrate towards the Arctic feeding grounds (Waring et al. 2014). Harp seals are known to occur in the Piscataqua River; however, they are not as abundant as the more commonly observed harbor seal (Crain 2015).

4.5.3 Behavior and Ecology

During breeding season, harp seals can be found in large numbers— up to several thousand seals— on the pack ice (NOAA Fisheries Service 2015). Harp seals feed primarily on a varied mix of species of finfish and invertebrates, particularly capelin, cod, and krill (NOAA Fisheries Service 2015). Harp seals are modest divers and usually dive to depths of up to 1,200 feet for up to 16 minutes (NOAA Fisheries Service 1015). There is no information on harp seal behavior in the Piscataqua River.

4.5.4 Acoustics

Along with other pinniped species and subspecies, harp seals are capable of hearing in both air and water. Hearing capabilities of this species have not been directly tested as they have for other species. However, as harp seals are within the *Phocididae* family, the functional hearing limit of these species is expected to be similar to that of other phocid seals. In general, the estimated bandwidth for functional hearing for phocids in water is 75 Hz to 75 kHz and in air is 75 Hz to 30 kHz (Southall et al. 2007). Pinnipeds in general are also known to produce a wide variety of low-frequency social sounds, with varying hearing capabilities in air and in water (Southall et al. 2007).

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5 Harassment Authorization Requested

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

Under Section 101 (a)(5)(D) of the MMPA, the Navy requests an Incidental Harassment Authorization (IHA) for the take of small numbers of marine mammals, by Level B behavioral harassment only, incidental to pile driving and drilling operations associated with the Waterfront Improvement Project at Portsmouth Naval Shipyard, Kittery, Maine. The Navy requests an IHA for incidental take of marine mammals described within this application for one year, commencing January 1, 2017 (or the issuance date, whichever is later). The Navy plans to request coverage under a new IHA for in-water construction activities during each subsequent year of the construction period, which is scheduled to end in March 2022. The Navy is not requesting a multi-year Letter of Authorization (LOA) at this time because the activities described herein are not expected to rise to the level of injury or death, which would require a LOA.

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 causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (50 C.F.R, Part 126, Subpart A, Section 216.3-Definiations).*

Level A harassment, an authorization for which is not requested herein, is the more severe form of harassment because it may result in injury, whereas Level B harassment may result in disturbance without the potential for injury.

5.1 Take Authorization Request

Under Section 101(a)(5)(D) of the MMPA, the Navy requests an IHA from NOAA Fisheries Service for Level B take (behavioral harassment) of small numbers of marine mammals described within this application as a result of in-water pile-driving, extraction, and drilling activities. The Navy requests coverage under the IHA to begin on January 1, 2017.

The exposure assessment methodology taken in this IHA application attempts to quantify potential exposures to marine mammals resulting from pile driving, extraction, and drilling. Section 6 presents a detailed description of the acoustic exposure assessment methodology. Results from this approach tend to provide an overestimation of exposures because all animals are assumed to be available to be exposed 100 percent of the time, and the formulas used to estimate transmission loss used idealized parameters, which are unrealistic in nature. Modeling was conducted for a full year, covering all four seasons.

The analysis for the Project predicts 96 potential exposures (see Section 6 for estimates of exposures by species and activity type) that could be classified as Level B harassment as defined under MMPA over the course of the project. The Navy's mitigation procedures, presented in Section 11, include monitoring of mitigation zones prior to initiating pile driving, extraction, or drilling; use of soft-start procedure; and instantaneous in situ hydroacoustic recordings. These mitigation measures would be implemented to

decrease the likelihood that marine mammals would be exposed to sound pressure levels that would cause Level B harassment.

The Navy does not anticipate that 96 actual harassment incidents would result from in-water activities for the waterfront improvement projects. However, to allow for scientific uncertainty regarding the exact mechanisms of potential physical and behavioral effects, and as a conservative approach, the Navy is requesting authorization for take (Level B harassment) of 96 marine mammals over the course of one year in this IHA application.

5.2 Method of Incidental Taking

Construction activities associated with the Project as outlined in Sections 1 and 2 have the potential to disturb or displace small numbers of marine mammals. Specifically, only underwater sounds generated from pile-installation activities (impact/vibratory pile driving, extraction, and drilling) may result in "take" in the form of Level B harassment (behavioral disturbance). Level B harassment is not anticipated from airborne sounds generated during pile installation or during other construction activities (see Section 6.3.4 below). Level A harassment is not anticipated to result from any of the construction activities, and measures designed to minimize the possibility of injury to marine mammals have been developed. Specifically, use of vibratory hammers and drilling would be the primary methods of installation and are not expected to cause injury to marine mammals due to these methods' relatively low source levels (≤ 180 dB). Also, pile driving would either not start or be halted if marine mammals approach the shutdown zone, which is defined as the distance at which Level A harassment is possible. See Section 11 for more details on the impact reduction and mitigation measures proposed. Furthermore, the pile-driving activities analyzed are similar to other construction activities within Washington State and California, which have taken place with no reported injuries or mortality to marine mammals (e.g., ICF Jones and Stokes and Illingworth and Rodkin, Inc. 2012). Chapter 6 discusses the numbers of takes requested for the marine mammal species in the Project area for this IHA.

6 Number and Species Exposed

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 NOAA Fisheries Service application for IHAs 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 or Level B). Section 5 defines MMPA Level A and Level B 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.

The construction activities for the waterfront improvement projects outlined in Sections 1 and 2 have the potential to take marine mammals by harassment only, primarily as a result of noise produced by in-water pile driving, extraction, and drilling. Other construction activities are not expected to result in takes as defined under the MMPA.

In-water pile driving would temporarily increase the local underwater noise environment in the vicinity of the Project area. Research suggests that increased noise may impact marine mammals in several ways, dependent on many factors (see Section 7 for additional discussion). The following sections provide a background on underwater sound, description of noise sources in the Project area, applicable noise criteria, and the basis for the calculation of take by Level B harassment. Level A harassment of cetaceans and pinnipeds for this project is not expected to occur because the area of potential Level A harassment is small, marine mammals are not expected to approach within this distance, and, if they did, monitoring as described later in this application would ensure curtailment of the activity before a Level A take occurs. Therefore, Level A harassment is not discussed in this application.

6.2 Fundamentals of Sound

Sound is a physical phenomenon consisting of regular pressure oscillations that travel through a medium, such as air or water. Sound frequency is the rate of oscillation, measured in cycles per second, or Hz. The amplitude (loudness) of a sound is its pressure, whereas its intensity, or power, is its pressure squared. The standard international unit of measurement for pressure is the Pascal, which is a force of 1 Newton exerted over an area of 1 square meter; sound pressures are measured in microPascals (μPa).

Due to the wide range of pressure and intensity encountered during measurements of sound, a logarithmic scale is used, based on the decibel, which, for sound intensity, is 10 times the log10 of the ratio of the measurement to reference value. For sound pressure level (SPL), the amplitude ratio in dB is 20 times the log10 ratio of measurement to reference. Hence, each increase of 20 dB in SPL reflects a 10-fold increase in signal amplitude (whether expressed in terms of pressure or particle motion). That is, 20 dB means 10 times the amplitude, 40 dB means 100 times the amplitude, 60 dB means 1,000 times the amplitude, and so on. Because the dB is a relative measure, any value expressed in dB is meaningless without an accompanying reference. In describing underwater sound pressure, the reference amplitude is usually 1 μPa and is expressed as “dB re 1 μPa.” For in-air sound pressure, the reference amplitude is usually 20 μPa and is expressed as “dB re 20 μPa.”

The method commonly used to quantify airborne sounds consists of evaluating all frequencies of a sound according to a weighted filter that mimics human sensitivity to amplitude as a function of frequency. This is called A-weighting, and the decibel level measured is called the A-weighted sound level (dBA).

Methods of frequency weighting that reflect the hearing of marine mammals have been proposed (Southall et al. 2007; Finneran and Jenkins 2012) and are being used in new analyses of Navy testing and training effects, but they have not been adopted for pile-driving and other non-explosive impulsive sounds (Marine Species Modeling Team 2012). Therefore, underwater sound levels are not weighted and measure the entire frequency range of interest. In the case of marine construction work, the frequency range of interest is 20 Hz to 20 kHz.

Table 6-1 summarizes commonly used terms to describe underwater sounds. Two common descriptors are the instantaneous peak SPL and the root mean square (rms) SPL. The peak pressure is the instantaneous maximum or minimum overpressure observed during each pulse or sound event and is presented in dB re 1 μPa. The rms level is the square root of the mean of the squared pressure level (intensity) as measured over a specified time period. All underwater sound levels throughout the remainder of this application are presented in dB re 1 μPa unless otherwise noted.

Table 6-1 Definition of Acoustical Terms

Term	Definition
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for water is 1 microPascal (μPa) and for air is 20 μPa (approximate threshold of human audibility).
Sound Pressure Level, SPL	Sound pressure is the force per unit area, usually expressed in μPa (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels (dB) as 20 times the logarithm to the base 10 of the ratio between the pressure exerted by the sound to a reference sound pressure. Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as hertz (Hz). Typical human hearing ranges from 20 Hz to 20,000 Hz.
Peak Sound Pressure (unweighted), dB re 1 μPa	Peak sound pressure level is based on the largest absolute value of the instantaneous sound pressure over the frequency range from 20 Hz to 20,000 Hz. This pressure is expressed in this application as dB re 1 μPa.
Root Mean Square (rms), dB re 1 μPa	The rms level is the square root of the energy divided by a defined time period. For pulses, the rms has been defined as the average of the squared pressures over the time that comprises that portion of waveform containing 90 percent of the sound energy for one impact pile-driving impulse.
Sound Exposure Level (SEL), dB re 1 μPa^2 sec	Sound exposure level is a measure of energy. Specifically, it is the dB level of the time integral of the squared-instantaneous sound pressure, normalized to a 1-second period. It can be an extremely useful metric for assessing cumulative exposure because it enables sounds of differing duration to be compared in terms of total energy.
Waveforms, μPa over time	A graphical plot illustrating the time history of positive and negative sound pressure of individual pile strikes shown as a plot of μPa over time (i.e., seconds).
Frequency Spectra, dB over frequency	A graphical plot illustrating the 6 to 12 Hz band-center frequency sound pressure over a frequency range (e.g., 10 to 5,000 Hz in this application).

Table 6-1 Definition of Acoustical Terms

Term	Definition
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A- or C-weighting filter network. The A-weighting filter de-emphasizes the low and high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective human reactions to noise.
Ambient Noise Level	The background sound level, which is a composite of noise from all sources near and far, that serves as the baseline or existing level of environmental noise at a given location.

6.3 Effects of Pile-installation Activities

6.3.1 Description of Noise Sources

Underwater sound levels are composed of multiple sources, including physical noise, biological noise, and anthropogenic noise. Physical noise sources include waves at the surface, earthquakes, ice movement, and atmospheric noise. Biological noise includes sounds produced by marine mammals, fish, and invertebrates. Anthropogenic noise consists of noise sources such as vessels (small and large), dredging, aircraft overflights, and construction activities. Known noise levels and frequency ranges associated with anthropogenic sources similar to the vessels and equipment that would be used for the Project are summarized in Table 6-2. Details of each of the sources are described in the following text.

Table 6-2 Representative Noise Levels of Anthropogenic Sources

Noise Source	Frequency Range (Hz)[1]	Underwater Noise Level (dB re 1 uPa)[2]	Reference
Small vessels	250-1,000	151 dB rms at 1 meter (m)	Richardson et al. 1995
Tug docking of a gravel barge	200-1,000	149 dB rms	Blackwell and Greene 2002
Vibratory driving of 30-inch steel pipe pile	10-1,500	~168 dB rms at 10m	WSDOT 2010a, 2010b
Impact driving of 30-inch steel pipe pile	10-1,500	~193 dB rms at 10m	WSDO 2005, 2008; Caltrans 2007; Reyff 2005
Impact driving of 36-inch steel pipe pile	10-1,500	195 dB rms at 10m	Hastings and Popper 2005

[1] These are the dominant frequency ranges but there is often considerable energy outside these ranges.
[2] These are average source SPLs at a particular location; site-specific bathymetry and substrate will affect SPLs.

In-water construction activities associated with the Project would include impact pile driving, drilling, and vibratory pile driving. The sounds produced by these activities fall into one of two sound types: pulsed and non-pulsed (defined below). Impact pile driving produces pulsed sounds, while vibratory pile driving produce non-pulsed (or continuous) 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 (e.g., Ward 1997 as cited in Southall et al. 2007).

Pulsed sounds (e.g., explosions, gunshots, sonic booms, seismic airgun pulses, and impact pile driving) are brief, broadband, atonal transients (American National Standards Institute 1986; Harris 1998) and occur either as isolated events or are repeated in some succession (Southall et al. 2007). Pulsed 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). Pulsed sounds generally have increased capacity to induce physical injury compared to sounds that lack these features (Southall et al. 2007).

Non-pulse (intermittent or continuous sounds) can be tonal, broadband, or both (Southall et al. 2007). Some non-pulse sounds can be transient signals of short duration but without the essential properties of pulses (e.g., rapid rise time) (Southall et al. 2007). Examples of sources of non-pulse sounds include vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems (Southall et al. 2007). The duration of such sounds, as received at a distance, can be greatly extended in highly reverberant environments (Southall et al. 2007).

6.3.2 Sound Exposure Criteria and Thresholds

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

> *"Any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding or sheltering."*

Since 1997, NOAA Fisheries Service has used generic sound exposure thresholds to determine when an activity in the ocean that produces sound might result in impacts to a marine mammal such that a take by harassment might occur (NOAA Fisheries Service 2005). Recent studies of pile driving, primarily for use in constructing offshore wind turbines, have validated the distances over which underwater sound from pile driving may exceed NOAA Fisheries Service thresholds (Bailey et al. 2010), as well as behavioral responses of harbor porpoises and bottlenose dolphins to intense sound from pile driving (Brandt et al. 2012; Brandt et al. 2011; Thompson et al. 2010; David 2006).

Current NOAA Fisheries Service practice regarding exposure of marine mammals to high-level sounds is that cetaceans and pinnipeds exposed to impulsive or continuous sounds of 180 and 190 dB rms or above, respectively, are considered to have been taken by Level A (injurious) harassment. Level A harassment is assumed to result in a "stress response." The stress response per se is not considered injury but refers to an increase in energetic expenditure that is a result of exposure to the stressor and that is predominantly characterized by either the stimulation of the sympathetic nervous system or the hypothalamic-pituitary-adrenal axis (Reeder and Kramer 2005). The presence and magnitude of a stress response in an animal depends on the animal's life history stage, environmental conditions, reproductive state, and experience with the stressor (Department of the Navy 2010a).

Behavioral harassment (Level B) is considered to have occurred when marine mammals are exposed to sounds at or above 160 dB rms for impulse sounds (*e.g.*, impact pile driving) and 120 dB rms for continuous noise (*e.g.,* vibratory pile driving or drilling) but below injurious thresholds. Behavioral harassment may or may not result in a stress response. The criteria for vibratory pile driving would also be applicable to vibratory pile extraction. The application of the 120 dB rms threshold can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations. As a result, these levels are considered precautionary (NOAA Fisheries Service2009, 74 FR 41684). NOAA Fisheries Service is developing new science-based thresholds to improve and replace the current generic exposure level thresholds, but the criteria have not been finalized (Southall et al. 2007; NOAA Fisheries Service2013). The current Level A (injury) and Level B (disturbance) thresholds are provided in Table 6-3.

Table 6-3 Injury and Disturbance Thresholds for Underwater and Airborne Sounds

Marine Mammal Functional Hearing Group	Airborne Marine Construction Criteria (Impact and Vibratory Pile Driving) (re 20 µPa)	Underwater Vibratory Pile Driving and Drilling Criteria (e.g., non-pulsed/continuous sounds) (re 1 µPa)		Underwater Impact Pile-driving Criteria (e.g., pulsed sounds) (re 1 µPa)	
	Distance Guideline Threshold (Haul out)[1]	Level A Injury Threshold	Level B Disturbance Threshold	Level A Injury Threshold	Level B Disturbance Threshold
Cetaceans (whales, dolphins, porpoises)	N/A	180 dB rms	120 dB rms	180 dB rms	160 dB rms
Pinnipeds (seals, sea lions, walrus; except harbor seal)	100 dB rms *(unweighted)*	190 dB rms	120 dB rms	190 dB rms	160 dB rms
Harbor seal	90 dB rms *(unweighted)*	190 dB rms	120 dB rms	190 dB rms	160 dB rms

1 Sound level at which pinniped haul out disturbance has been documented. Not an official threshold, but used as a guideline.

Key:
dB = decibel

6.3.3 Limitations of Existing Noise Criteria

To date, there is no research or data supporting a response by pinnipeds or odontocetes to continuous sounds from vibratory pile driving as low as the 120 dB rms threshold. The 120 dB rms threshold level for continuous noise originated from research conducted by Malme et al. (1984, 1986) for California gray whale response to continuous industrial sounds such as drilling operations. The 120 dB rms continuous sound threshold should not be confused with the 120 dB rms pulsed sound criterion established for migrating bowhead whales in the Arctic as a result of research in the Beaufort Sea (Richardson et al. 1995; Miller et al. 1999). Southall et al. (2007) reviewed studies conducted to document behavioral responses of harbor seals and northern elephant seals to continuous sounds under various conditions and concluded that those limited studies suggest that exposures between 90 dB and 140 dB re 1 µPa rms generally do not appear to induce strong behavioral responses.

6.3.4 Ambient Noise

Ambient noise by definition is background noise, and it has no single source or point. Ambient noise varies with location, season, time of day, and frequency. Ambient noise is continuous but with much variability on time scales ranging from less than 1 second to 1 year (Richardson et al. 1995). Ambient underwater noise at the Project area is widely variable over time due to a number of natural and anthropogenic sources. Sources of naturally occurring underwater noise include wind, waves, precipitation, and biological noise (such as shrimp, fish, and cetaceans). There is also human-generated noise from ship or boat traffic and other mechanical means (Urick 1983). Anthropogenic sources of underwater noise at industrial waterfronts could come from cranes, generators, and other types of mechanized equipment on wharves or the adjacent shoreline. In the vicinity of the Project area, the average broadband ambient underwater noise levels are commonly 52.8 to 80.5 L_{sel} dB re 1µPa with

substantially higher maximum peak readings (79.9 to 103.9 L_{peak} dB re 1μPa) due to passing boats and industrial noise (ESS Group, Inc. 2015).

6.4 Distance to Sound Thresholds

6.4.1 Underwater Sound Propagation Formula

Pile driving would generate underwater noise that potentially could result in disturbance to marine mammals in and near the Project area. Transmission loss (TL) underwater is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The formula for transmission loss is:

TL = B * log10(R) + C * R, where
B = logarithmic (predominantly spreading) loss
C = linear (scattering and absorption) loss
R = range from source in meters

For underwater calculations in this assessment, linear loss (C) was not used (i.e. C=0), and transmission loss was calculated using only logarithmic spreading. Therefore, the revised formulas for transmission loss were as follows:

1. Cylindrical Spreading: $TL = 10 \log (R_1/R_0)$

   where:
   TL = transmission loss[1]
   R_1 = range at which NOAA Fisheries acoustic criteria is reached
   R_0 = reference range (i.e., at 10 meters)

   This transmission loss model was used for piles being driven in a water depth less than approximately 10 feet. Specifically, this model was used for the 14-inch steel H-type (sister) piles that would be driven using an impact hammer at Rail Beam R1 at Berths 11, 12, and 13 (shown on Figure 2-2).

2. Practical Spreading: $TL = 15 \log (R_1/R_0)$

   where:
   TL = transmission loss
   R_1 = range at which NOAA Fisheries acoustic criteria is reached
   R_0 = reference range (i.e., at 10 meters)

   This transmission loss model was used for the piles being driven (or drilled) in water depths of between approximately 10 and 50 feet. These pile types and sizes included:

   - **25-inch steel sheet piles,** which would be driven using a vibratory hammer at **Berth 11**.
   - **14-inch steel H-type piles,** which would be driven using an impact hammer at **Berth 11**during trestle alignment and construction.

[1] Transmission Loss = source level – acoustic criteria threshold level

- **15-inch timber piles,** which would be installed using a vibratory hammer to reconstruct timber dolphins at the corner of **Berths 11 and 12**.
- **36-inch steel H-type (king) piles** at **Berth 11** which would be drilled and rock-socketed into the bedrock.

This model was also used for piles extracted in water depths of 10 to 50 feet and included:

- **14-inch steel H-type piles,** which would be used to align and construct the trestle that would be extracted using a vibratory hammer at **Berth 11**.
- **15-inch timber fender piles,** which would be extracted using a vibratory hammer at **Berth 11** and the timber dolphin at the corners of **Berths 11 and 12**.

6.4.2 Underwater Noise from Pile Driving and Drilling

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. A large quantity of literature regarding SPLs recorded from pile-driving projects is available for consideration. In order to determine reasonable SPLs and the associated effects on marine mammals that are likely to result from pile driving at the Shipyard, studies with similar properties to the Proposed Action were evaluated.

Pile Driving

Source levels for the two pile-driving methods that are proposed for use during the project were obtained from the "Compendium of Pile Driving Sound Data," which is included as Appendix I to "Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish" (ICF Jones & Stokes and Illingworth & Rodkin, Inc. 2012). The information presented in the compendium is a compilation of sound pressure levels recorded during various in-water pile-driving projects in California, Oregon, Washington, and Nebraska. The compendium is a commonly used reference document for pile-driving source levels when analyzing impacts on protected species, including marine mammals, from pile-driving activities.

Source levels were collected for the four types of piles that would be installed and two pile-driving methods proposed for the Project:

1. <u>14-inch steel H-type piles</u> — Used as sister piles and to align and construct the trestle; installed via impact hammer.
2. <u>15-inch timber piles</u> — Used for re-installation of dolphins at Berths 11, 12, and 13 and installed via vibratory hammer.
3. <u>25-inch steel sheet piles</u> — Used for the bulkhead at Berth 11 and installed via vibratory hammer.

Reference source levels for the Project were determined using data for piles of similar sizes, the same pile-driving method as that proposed for the Project, and at similar water depths. While the pile sizes and water depths chosen as proxies do not exactly match those for the Project, they are the closest matches available, and it is assumed that the source levels shown in Table 6-4 and Table 6-5 are the most representative for each pile type and associated pile-driving method.

Table 6-4 Source Levels for In-Water Impact Hammer 14-inch Steel H-type (Sister) Piles

Pile Size and Pile Type	Water Depth (m)	Distance Measured (m)	Peak (dB)	RMS (dB)	SEL (dB)	Location
12-inch Steel H-type pile – Thick	5	10	200	183	170	CA (Specific location unknown)
15-inch Steel H-type pile – Thick	3	10	195	180	170	Ballena Isle Marina Alameda, CA San Francisco Bay
12- to 15-inch H-type pile – Thick (Average)	**4**	**10**	**198**	**182**	**170**	

Source: ICF Jones & Stokes and Illingworth & Rodkin, Inc. 2012.

Note:
All source levels are referenced to 1 microPascal (re 1 µPa).
[1] As printed in source material

Key:
dB = decibel
m = meter
RMS = root mean square
SEL = sound exposure level

Table 6-5 Source Levels for In-Water Vibratory Hammer 25-inch Steel Sheet Piles, 20-inch Steel Sheet Piles and 15-inch Timber Piles

Pile Size and Pile Type	Water Depth (m)	Distance Measured (m)	Peak (dB)	RMS (dB)	SEL (dB)	Location
24-inch AZ* Steel Sheet[1]	15	10	177	163	162	Berth 23, Port of Oakland, CA
24-inch AZ Steel Sheet[1]	15	10	175	162	162	Berth 30, Port of Oakland, CA
24-inch AZ Steel Sheet[1]	15	10	177	163	163	Berth 35/37 Port of Oakland, CA
24-inch AZ Steel Sheet – Typical[1]	15	10	175	160	160	CA (Specific location unknown)
24-inch AZ Steel Sheet – Loudest[1]	15	10	182	165	165	CA (Specific location unknown)
24-inch AZ Steel Sheet (Average)[1]	**15**	**10**	**178**	**163**	**163**	
15-inch Timber Pile[2]	**10**	**16**	**164**	**150**	**NP**	WSF Port Townsend Ferry Terminal, WA

Source:
[1] ICF Jones & Stokes and Illingworth & Rodkin, Inc. 2012.
[2] WSDOT 2010.

Note:
All source levels are referenced to 1 microPascal (re 1 µPa)
AZ refers to a specific sheet pile shape and interlock style

Key:
dB = decibel
m = meter
RMS = root mean square
SEL = sound exposure level

The exact source level for a given pile and pile-driving method largely depends not only on the pile size and water depth but also on site-specific conditions such as environmental and physical factors, including water temperature and sediment composition. Therefore, in this analysis, several source levels for each pile type and associated pile-driving method were averaged when multiple levels were available. These averaged source levels were used as inputs to determine transmission loss, which, in turn, was used in the propagation models described above. It should be noted that the source levels presented in the tables below do not take into account any mechanisms to attenuate the sound, such as a bubble curtain.

Drilling

Drilling is considered an intermittent, non-impulsive noise source, similar to vibratory pile driving. Very little information is available regarding source levels of in-water drilling activities associated with nearshore pile installation such as that proposed for the Berths 11, 12, and 13 structural repairs project. Dazey et al. (2012) attempted to characterize the source levels of several marine pile-drilling activities. One such activity was auger drilling (including installation and removal of the associated steel casing). The average sound pressure levels re 1 µPa RMS were displayed for casing installation, auger drilling (inside the casing), and casing removal. For the purposes of this plan, it is assumed that the casing installation and removal activities would be conducted in a manner similar to that described in Dazey et al. (2012), primarily via oscillation. These average source levels are reported in Table 6-6.

IHA applications for other construction projects have reported that, due to a lack of information regarding pile-drilling source levels, it is generally assumed that pile drilling would produce less in-water noise than both impact and vibratory pile driving. Based on the general lack of information about these activities and the assumption that in-water noise from pile drilling would be less than either impact or vibratory pile driving, it is assumed that the source levels presented in Table 6-6 are the most applicable for acoustic impact analysis at Berths 11, 12, and 13.

Table 6-6 Average Source Levels for Auger Drilling Activities During Pile Installation

Drilling Activity	Water Depth (m)	Distance Measured (m)	RMS (dB)	Location
Casing Installation	1-5	1	157	Bechers Bay Santa Rosa Island, CA
Auger Drilling	1-5	1	151	Bechers Bay Santa Rosa Island, CA
Casing Removal	1-5	1	152	Bechers Bay Santa Rosa Island, CA

Source: Dazey et al. 2012.

Note: All source levels are referenced to 1 microPascal (re 1 µPa)

Key:
dB = decibel
m = meter
RMS = root mean square

Pile Extraction

Vibratory pile extraction is considered an intermittent, non-impulsive noise source. Little information is available specific to vibratory extraction for most types of piles. The source level for timber-pile extraction was obtained from "Port Townsend Test Pile Project: Underwater Noise Monitoring Draft

Final Report," prepared by Jim Loughlin for the Washington State Department of Transportation Office of Air Quality and Noise (WSDOT 2010).

Source levels for vibratory extraction of H-type piles were obtained from "Underwater Acoustic Measurements of Vibratory Pile Driving at the Pipeline 5 Crossing in the Snohomish River, Everett, Washington," prepared by Greeneridge Science, Inc., for the City of Everett (Burgess et al. 2005).

For vibratory pile extraction of the 24-inch steel sheet piles (used as a proxy for the 20-inch steel sheet piles that would be extracted at the circular, cellular cofferdam), the average value for the vibratory installation source levels from Table 6-5 was used. Sources including ICF Jones & Stokes and Illingworth & Rodkin, Inc. (2012) report the same values for vibratory installation and extraction, assuming that the two activities would produce similar source levels if water depth, pile size, and equipment remain constant.

Source levels were collected from the documents and reports described above for four types of piles for vibratory pile extraction proposed for these projects (see Table 6-7):

1. 15-inch timber fender piles — Extracted via vibratory extractor at Berth 11 and the corner of Berths 11 and 12.

Table 6-7 Average Source Level for Vibratory Pile Extraction15-inch Timber Fender Piles

Pile Size and Pile type	Water depth (m)	Distance Measured (m)	Peak (dB)	RMS (dB)	Location
15-inch Timber Fender Pile[1]	**10m**	**16m**	**164**	**150**	WSF Port Townsend Ferry Terminal, WA

Notes
[1] WSDOT 2010.
[2] All source levels are referenced to 1 microPascal (re 1 µPa)

Key:
dB = decibel
m = meter
RMS = root mean square

Reference source levels for the Project were determined using data for piles of similar size, the same extraction method as that proposed for the Project, and at similar water depths. While the pile sizes and water depths chosen as proxies do not exactly match those for the Project, they are the closest matches available, and it is assumed that the source levels shown in Table 6-7 are representative of the vibratory pile extraction method used for the Project.

Zones of Influence

NOAA Fisheries has established disturbance and injury acoustic thresholds for marine mammals. A zone of influence (ZOI) is the in-water area in which sound from an in-water activity would exceed a particular threshold level. Determining a ZOI for each sound source is necessary to establish monitoring areas and to estimate the number of Level B takes (harassment). Attenuation distances to the NOAA Fisheries thresholds for Level B takes for pile driving are described in Table 6-8. These attenuation distances have been developed using the propagation models described in Section 6.4.1. Modeling was performed for

each driving, drilling, installing, and removing activity described above using the depth-appropriate model. Activities that would result in the longest attenuation distances were selected as the worst-case sound exposure distances that would determine the ZOI for each project location. These worst-case sound exposure distances are shown in Table 6-8.

Table 6-8 Pile-driving Sound Exposure Distances (In-water)

Drilling Activity	Behavioral Thresholds for Cetaceans and Pinnipeds	Propagation Model	Attenuation Distance to Threshold
Vibratory Hammer	120 dB RMS	Practical Spreading Loss (3 m to15 m water depth)	4.57 mi (7.35 km)
Impact Hammer	160 dB RMS	Cylindrical Spreading Loss (<3 m water depth)	0.984 mi (1.58 km)

Note: All source levels are referenced to 1 microPascal (re 1 μPa)

Key:
dB = decibel
mi = miles
km = kilometers
m = meters
RMS = root mean square

During operation of the vibratory hammer, modeled sound would attenuate to 120 dB at approximately 4.57 miles from the Berth 11 Structural Repairs Project. During operation of the impact hammer, modeled sound would attenuate to 160 dB at approximately 0.98 miles from the Berths 11 Structural Repairs Project site. It should be noted that these attenuation distances are based on sound characteristics in open water. The Project area is located in a river surrounded by topographic features and not in open water; therefore, given the numerous land features and islands within the vicinity of the Project sites in the Piscataqua River, these attenuation distances are extremely conservative.

While the Project would involve impact pile driving that would exceed acoustic thresholds for Level A takes, no Level A takes are expected because attenuation out to the pinniped injury threshold of 190 dB rms is calculated at 282 feet (85.9 meters), and attenuation out to the 180 dB RMS injury threshold for cetaceans is calculated at 52 feet (15.8 meters). These very small areas can easily be monitored for marine mammals, and mitigative measures could be implemented to ensure that no Level A takes occur.

The ZOIs for each of the two separate sound sources (vibratory and impact hammers) at Berth 11are shown on Figure 6-1. Work would occur in phases over several years. All of the construction-related in-water sound occurring within the waters of these ZOIs would exceed the designated NOAA Fisheries thresholds for behavioral take. The ZOIs were used to calculate potential takes from each sound source and would be monitored during in-water work at Berth 11 to estimate actual harassment takes of marine mammals. The total area ensonified by these two sources is 0.36 square miles (mi^2) (233.4 acres).

The numerous topographic features present in and along the Piscataqua River would greatly limit the area that would be impacted from in-water sound. Sound from either source would be truncated with minimal attenuation. The ZOIs for Berth 11 have been determined using the entire length of the berth and the returns that would be constructed between the existing bulkhead and the new bulkhead. Due to the numerous islands and other land features at and around the site, the ZOIs for both the vibratory hammer and impact hammer are identical.

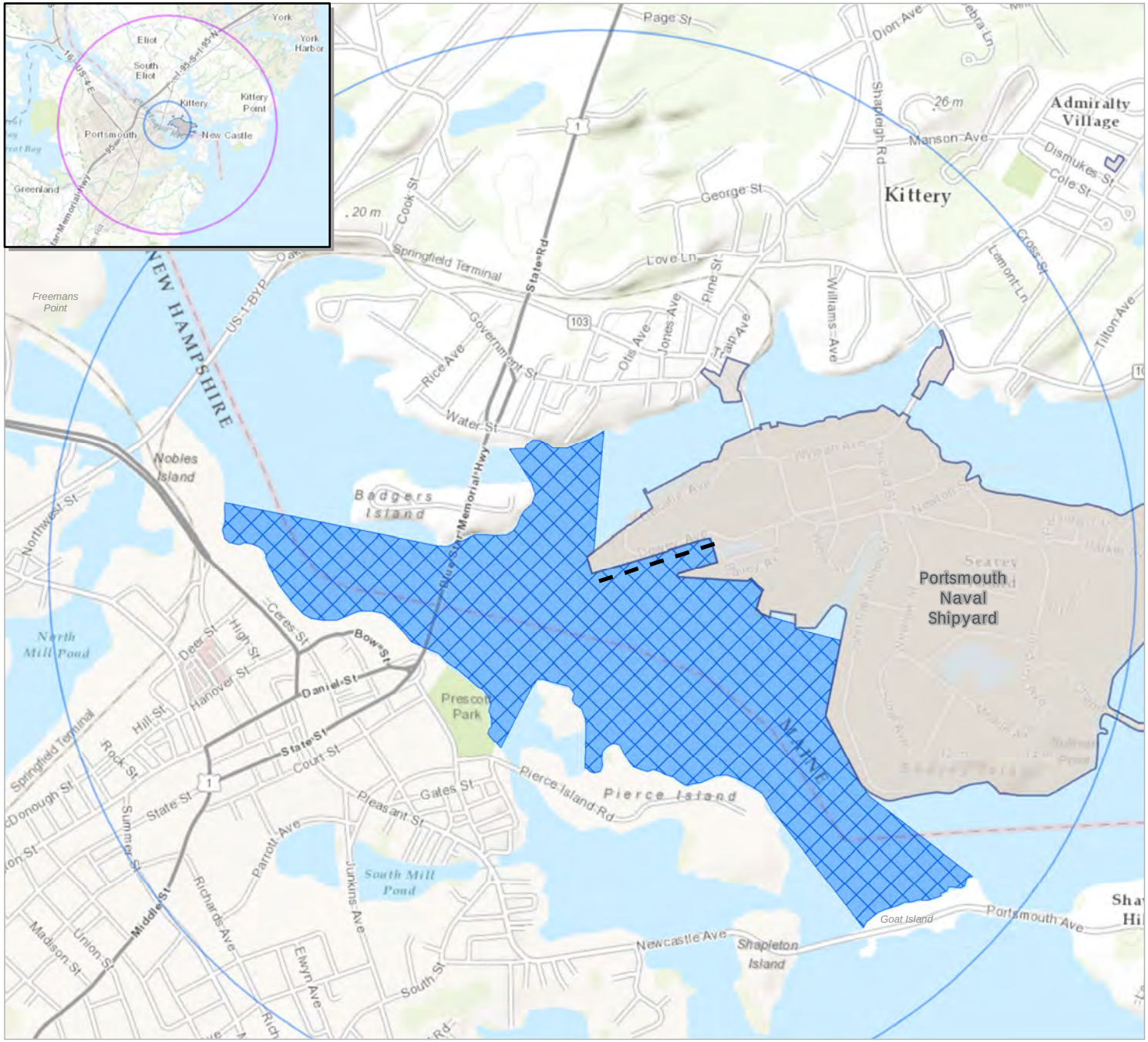

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Figure 6-1
Zone of Influence
for Underwater Vibratory Hammer
and Underwater Impact Hammer
at Berth 11 (A, B, and C)
Portsmouth Naval Shipyard
York County, Maine

Legend

- Berth 11
- Zone of Influence for Underwater Vibratory Hammer
- Zone of Influence for Underwater Impact Hammer
- 4.57 mi (7.35 Km) Radius
- 0.98 mi (1.58 Km) Radius
- Installation Area

N

0 1,000 2,000 3,000 Feet

Source: ESRI 2013; Department of Defense 2014.

No sound is expected to attenuate to the 120-decibel threshold for vibratory pile driving because topographic features along the river would prevent attenuation to the full distance of 4.57 miles. The longest attenuation distance from the Project area would occur almost directly to the southeast where, during vibratory pile driving, sound would attenuate through the waters east of Pierce Island to meet land at Goat Island at a distance of 0.88 miles from the Project area (Figure 6-1).

Very little sound would reach the 160 dB threshold at the fill distance of 0.984 miles for the impact hammer due to these topographical features. The longest attenuation distance from the Berth 11 Project site would again occur to the southeast where, during impact pile driving, sound would attenuate through the waters east of Pierce Island to the 160 dB threshold (a distance of 0.88 miles) at Goat Island (Figure 6-1).

6.4.3 Airborne Sound from Pile Driving and Drilling

Pile driving can generate airborne noise that could potentially result in disturbance of marine mammals (pinnipeds) 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 near the project sites to be exposed to airborne SPLs that could result in Level B behavioral harassment. The appropriate airborne noise thresholds for behavioral disturbance for all pinnipeds, except harbor seals is 100 dB re 20 µPa rms (unweighted) and for harbor seals is 90 dB re 20 µPa rms (unweighted) (see Table 6-3). A spherical spreading loss model, assuming average atmospheric conditions, is typically used to estimate the distance to the 100 dB and 90 dB re 20 µPa rms (unweighted) airborne thresholds. The formula for calculating spherical spreading loss is:

$$TL = 20\log r$$

where:

TL = Transmission loss
r = ratio of receiver distance

*Spherical spreading results in a 6 dB decrease in SPL per doubling of distance.

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. In order to determine reasonable airborne SPLs and their associated effects on marine mammals that are likely to result from pile driving at Portsmouth Naval Shipyard, studies with similar properties to the proposed action were evaluated. In Order to determine if airborne noise impacts would need to be considered, the worst case scenario, impact driving of the 14-inch h-type piles, was modeled. As values for impact-driven H-type piles, including the 14-inch size, were not available source levels for various larger round piles were examined as conservative proxies. Airborne transmission loss was calculated using the spherical spreading model described above. Using this model, the greatest possible distances to airborne harassment thresholds were estimated, using a source level of 111 dB 20 µPa rms for 24" round steel piles, as 552.5 ft (168.3 m) to the 90 dB threshold for harbor seals and 174.5 ft (53.2 m) to the 100 dB threshold for all other seals. All proxy source levels analyzed and the associated distances ZOI thresholds are provided in Table 6-9. Other types of pile driving and extraction that would occur during the project would generate lower airborne sound pressures, with smaller distances and areas of potential disturbance, and for that reason are not considered further in this application. Since protective measures are in place out to the distances calculated for the underwater Level B thresholds, the distances for the airborne thresholds will be effectively covered by monitoring. The closest known haul-out site for seals within the Piscataqua River

is 1.5 miles (2414 m) downstream of the Project area (see Figure 6-2) while the attenuation distance to the 90 dB threshold is 0.108 miles (174.5 m) and the 100 dB threshold is 0.033 miles (53.2 m). Therefore, acoustic disturbance to pinniped species while hauled out is unlikely, and takes resulting from airborne sound from pile driving and drilling are not considered further in this application.

Table 6-9 Calculated Distances to Airborne Noise Thresholds During Impact Pile-Driving for Proxy Source Levels

Pile Driving Source	Source Level (dB rms measured at 15m)	Maximum Distance to 90 dB Threshold (Harbor Seal)	Maximum Distance to 100 dB Threshold (Pinnipeds except Harbor Seals)
30-inch round steel pile-impact driven	110[1]	492.2 ft (150.0 m)	155.2 ft (47.3 m)
24-inch round steel pile-impact driven	111[1]	552.5 ft (168.3 m)	174.5 ft (53.2 m)
18-inch round steel pile-impact driven	103[2]	219.9 ft (67.0 m)	69.6 ft (21.2 m)

Source:
[1] Navy 2013
[2] Source: Washington State Department of Transportation (WDSOT) 2010

Note: All source levels are referenced to 20 microPascal (re 20 µPa)

Key:
dB = decibel
mi = miles
km = kilometers
m = meters
rms = root mean square

6.4.4 Auditory Masking

Natural and artificial sounds can disrupt behavior by masking, or interfering with a marine mammal's ability to hear other sounds. Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher levels. If the second sound is manmade and disrupts hearing-related behavior such as communications or echolocation (Wartzok et al. 2003/04), it could be considered harassment under the MMPA. Noise can only mask a signal if it is within a certain "critical band" 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. 2003, 2004). In delphinid subjects, for example, relevant signals needed to be 17 to 20 dB rms louder than masking noise at frequencies below 1 kHz in order to be detected and 40 dB greater at approximately 100 kHz (Richardson et al. 1995). It is important to distinguish between temporary threshold shift (TTS) and permanent threshold shift (PTS), which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without a resulting threshold shift) is not associated with abnormal physiological function, it is not considered a physiological effect in this IHA application, but rather a potential behavioral effect.

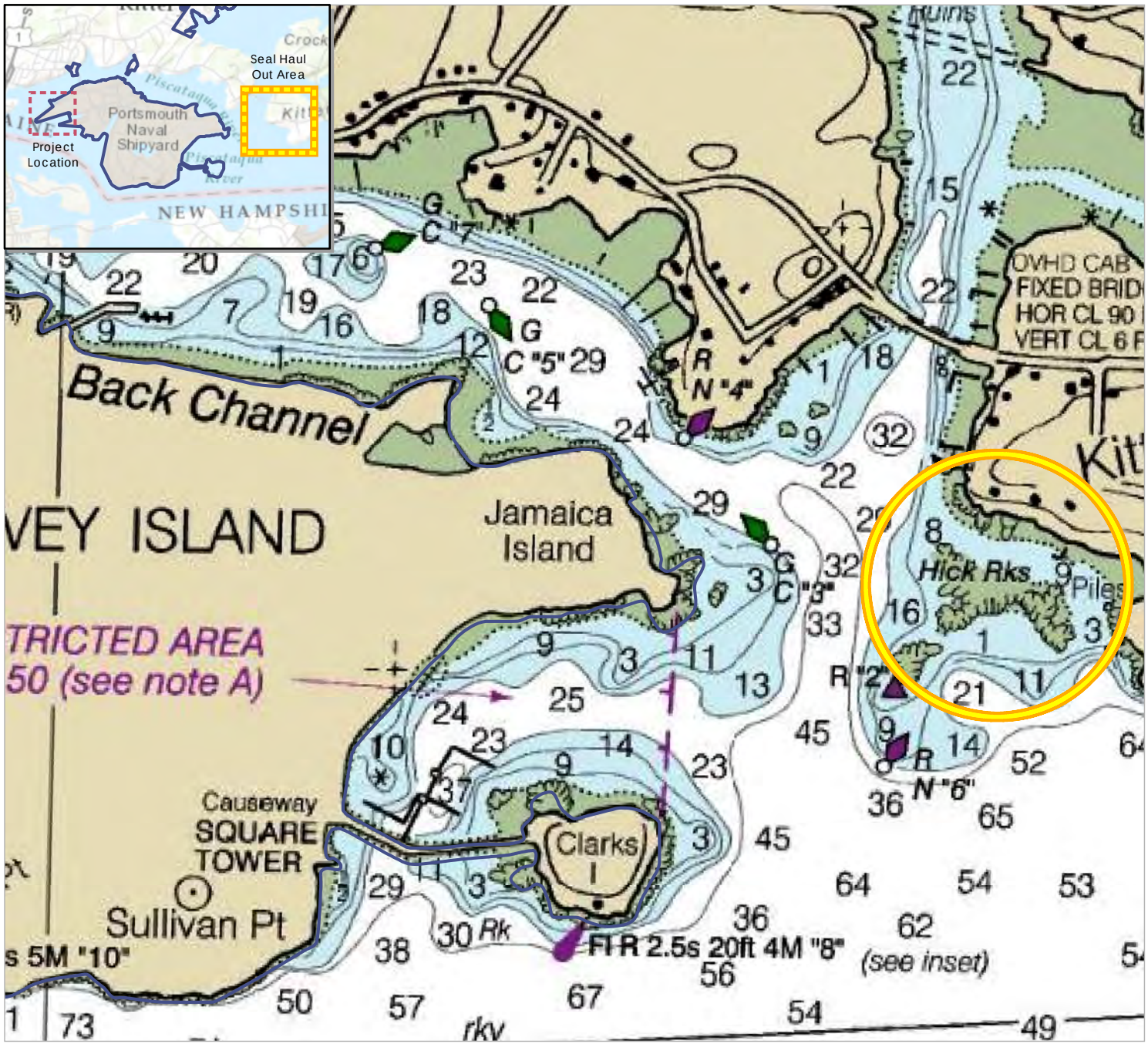

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Figure 6-2
Seal Haul-Out Site at
Hicks Rocks
Portsmouth Naval Shipyard
York County, Maine

Legend

- Installation Area
- Seal Haul Out Site
- Project Area

N

0 250 500 750 1,000 Feet

Source: ESRI 2013; Department of Defense 2014.

The most intense underwater sounds expected to result from the Project are those produced by impact pile driving. Given that the energy distribution of pile driving covers a broad frequency spectrum, sound from these sources would likely be within the audible range of grey seals, harbor seals, hooded seals, and harp seals. Impact pile-driving activity is relatively short term, with rapid pulses occurring for approximately 15 minutes per pile. Vibratory pile driving is also relatively short term, with rapid oscillations occurring for approximately 1.5 hours per pile. It is possible that impact and vibratory pile driving resulting from the Project may mask some acoustic signals that are relevant to the daily behavior of marine mammal species, but the short-term duration and limited areas affected make it very unlikely that fitness of individuals or stocks would be affected. Masking effects are, therefore, treated as negligible. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory and impact pile driving, and which have already been taken into account in the exposure analysis.

6.5 Basis for Estimating Take by Harassment

The Navy is seeking authorization for the potential taking of small numbers of harbor porpoises grey seals, harbor seals, hooded seals, and harp seals near the Shipyard as a result of pile removal and pile driving during demolition and construction activities associated with the 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.

6.5.1 Harbor Porpoise

Harbor porpoises may be present in the Project area during spring, summer, and fall, from April to December. Based on density data from the Navy Marine Species Density Database, their presence is highest in spring, decreases in summer, and slightly increases in fall. However, in general, the porpoises are known to occasionally occur in the river. Average density for the predicted seasons of occurrence was used to determine abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI. Estimated abundance for harbor porpoises was 0.88/day. (Average density for spring, summer, and fall = 0.9578.)

Potential takes could occur if harbor porpoises move through the area on foraging trips during pile driving or extraction. Harbor porpoises that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, harbor porpoises may move away from the sound source and be temporarily displaced from waters near the construction areas. With the absence of any regular occurrence adjacent to the project site, potential takes by disturbance would have a negligible short-term effect on individual harbor porpoises and would not result in population-level impacts.

6.5.2 Grey Seal

Grey seals may be present year-round in the project vicinity, with constant densities throughout the year. Grey seals are less common in the Piscataqua River than the harbor seal. Average density for the predicted seasons of occurrence was used to determine abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI. Estimated abundance for grey seals was 0.21/day (average year-round density = 0.2202).

Potential takes could likely involve grey seals that are moving through the area on foraging trips or to the downstream haul-out site as a result of underwater or airborne noise during pile-driving or extraction. Grey seals that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, grey 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 isolated haul-out site 1.5 miles from the Project area, potential takes by disturbance would have a negligible short-term effect on individual grey seals and would not result in population-level impacts.

6.5.3 Harbor Seal

Harbor seals may be present year-round in the project vicinity, with constant densities throughout the year. Harbor seals are the most common pinniped in the Piscataqua River near the Shipyard. Average density for the predicted seasons of occurrence was used to determine abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI. Abundance for harbor seals was 0.19/day. (Average year-round density = 0.1998.)

Potential takes could likely involve harbor seals that are moving through the area on foraging trips or to the downstream haul-out site as a result of underwater or airborne noise during pile driving or extraction. Harbor seals that are taken could 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. With the absence of any major rookeries and only one isolated haul-out site 1.5 miles from the Project area, potential takes by disturbance would have a negligible short-term effect on individual harbor seals and would not result in population-level impacts.

6.5.4 Hooded Seal

Hooded seals may be present in the project vicinity during the winter and spring, from January through May, though their exact seasonal densities are unknown. In general, hooded seals are much rarer than the harbor seal and grey seal in the Piscataqua River. Anecdotal sighting information indicates that two hooded seals were observed from the Shipyard in August 2009, but no other observations have been recorded (Trefry November 20, 2015). These animals are conservatively assumed to be present within the underwater Level B ZOI during each day of in-water pile driving. Average density for the predicted seasons of occurrence was used to determine abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI. Abundance for hooded seals was 0/day (average density for winter and spring = unknown, known to be rare).

Potential takes would likely involve hooded seals that are moving through the area on foraging trips or to the downstream haul-out site as a result of underwater or airborne noise during pile-driving or extraction. Hooded seals that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. 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 isolated haul-out site 1.5 miles downstream of the Project area, potential takes by disturbance would have a negligible short-term effect on individual hooded seals and would not result in population-level impacts.

6.5.5 Harp Seal

Harp seals may be present in the Project vicinity during the winter and spring, from January through February. In general, harp seals are much rarer than the harbor seal and grey seal in the Piscataqua River. These animals are conservatively assumed to be present within the underwater Level B ZOI during each day of in-water pile driving. Average density for the predicted seasons of occurrence was used to determine abundance of animals that could be present in the area for exposure, using the equation abundance = n * ZOI. Abundance for harp seals was 0.014/day (average year-round density = 0.0125).

Potential takes would likely involve harp seals that are moving through the area on foraging trips or to the downstream haul-out site as a result of underwater or airborne noise during pile-driving or extraction. 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 isolated haul-out site 1.5 miles from the Project area, potential takes by disturbance would have a negligible short-term effect on individual harp seals and would not result in population-level impacts.

6.6 Description of Take Calculation

The take calculations presented here relied on the best data currently available for marine mammal populations within close proximity to the Piscataqua River. There are not population data for any marine mammal species specifically within the Piscataqua River; however, the population data used are from the most recent NOAA Fisheries Service Stock Assessment Reports (SAR) for the Atlantic Ocean. The most recent SAR population number was used for each species. The specific SAR used is discussed within each species take calculation in Sections 6.6.1 through 6.6.5. The formula was developed for calculating take due to pile driving, extraction, and drilling and applied to the species-specific noise-impact threshold. The formula is founded on the following assumptions:

- All piles to be installed would have a noise disturbance distance equal to the pile that causes the greatest noise disturbance.
- Pile driving could potentially occur every day of the in-water work window; however, it is estimated no more than a few hours of pile driving would occur per day.
- An individual can only be taken once per day due to sound from pile driving, whether from impact or vibratory pile driving, or vibratory extraction
- The conservative assumption is made that all pinnipeds within the ZOI would be underwater during at least a portion of the noise generating activity and, hence, exposed to sound at the predicted levels.

The calculation for marine mammal takes is estimated by:

$$\text{Take estimate} = (n * ZOI) * X \text{ days of total activity}$$

where:

n = density estimate used for each species/season
X = number of days of pile driving, estimated based on the total number of piles and the average number of piles that the contractor can install per day.
ZOI = noise threshold zone of influence (ZOI) impact area

The calculation n * ZOI produces an estimate of the abundance of animals that could be present in the area for exposure. The abundance is then multiplied by the total number of days of pile-driving to determine the take estimate. Because the estimate must be a whole number, this value was rounded up.

The ZOI impact area is the estimated range of impact on marine mammals during in-water construction. The ZOI is the area in which in-water sound would exceed designated NOAA Fisheries Service thresholds.. The formula for determining the area of a circle ($\pi * radius^2$) was used to calculate the ZOI around each pile, for each threshold. The distances specified were used for the radius in the equation. All impact pile driving take calculations were based on the estimated threshold ranges without using a bubble curtain with 10 dB attenuation as a mitigation measure. The ZOI impact area took into consideration the

possible affected area of the Piscataqua River from the furthest pile driving/extraction site with attenuation due to land shadowing from bends in the river. As described in Section 6.4 with regard to the distances, because of the proximity of some of the piles to the shore, the narrowness of the river at the Project area, and the maximum fetch (*i.e.*, area impacted by wind and wind-generated waves), the ZOIs for each threshold aren't necessarily spherical and may be truncated.

6.6.1 Harbor Porpoise

As described in Section 6.5.1, the average number of harbor porpoises present within ZOIs for Level B harassment by impact and/or vibratory pile driving is 0.88/day, resulting in a take estimate of 64 Level B exposures for 72 days of pile installation.

6.6.2 Grey Seal

As described in Section 6.5.2, the average number of grey seals present within ZOIs for Level B harassment by impact and/or vibratory pile driving is 0.21/day, resulting in a take estimate of 16 Level B exposures for 72 days of pile driving.

6.6.3 Harbor Seal

As described in Section 6.5.3, the average number of harbor seals present within ZOIs for Level B harassment by impact and/or vibratory pile driving is 0.19/day, resulting in an estimate of 14 Level B exposures for 72 days of pile-driving.

6.6.4 Hooded Seal

As described in Section 6.5.4, the average number of hooded seals present within ZOIs for Level B harassment by impact and/or vibratory pile driving is 0/day, resulting in an estimate of 0 Level B exposures for 72 days of piledriving.

6.6.5 Harp Seal

As described in Section 6.5.5, the average number of harp seals present within ZOIs for Level B harassment by impact and/or vibratory pile driving is 0.014/day, resulting in an estimate of 2 Level B exposures for 72 days of pile driving.

6.7 Summary

Based on the modeling results presented above, the total numbers of takes that the Navy is requesting for the five marine mammal species that may occur within the Project area during the duration of proposed in-water construction activities are presented below in Table 6-10. Takes are currently expected to occur year-round. There is the potential for 64 Level B disturbance takes of harbor porpoises, 16 Level B disturbance takes of grey seals, 14 Level B disturbance takes of harbor seals, 0 Level B disturbance takes of hooded seals, and 2 Level B takes of harp seals. Takes may occur from either impact or vibratory pile-driving operations. The analysis conservatively assumes that both types of pile-driving operations could occur concurrently.

Table 6-10 Total Number of Takes, by Species and Impact Injury Threshold

Species	Impact Injury Threshold (190 dB rms)	Impact Injury Threshold (180 dB rms)	Both Impact Disturbance Threshold (160 dB) and Vibratory Disturbance Threshold (120 rms)
Harbor porpoise	N/A	0	64
Grey seal	0	N/A	16
Harbor seal	0	N/A	14
Hooded seal	0	N/A	0
Harp Seal	0	N/A	2
Total	**0**	**0**	**96**

Note: All source levels are referenced to 1 microPascal (re 1 µPa).

Key:
dB = decibel
rms = root-mean squared
N/A = Not applicable

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 and Drilling on Marine Mammals

7.1.1 Underwater Noise Effects

The effects of pile driving on marine mammals are dependent on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the pile-driving sound; the depth of the water column; the substrate of the habitat; the standoff distance between the pile and the animal; and the sound-propagation properties of the environment. Impacts to marine mammals from pile-driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The farther away from the source, the less intense the exposure 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 (i.e., mud) would absorb or attenuate the sound more readily than hard substrates (rock), which may reflect the acoustic wave. Soft, porous substrates would also likely result in shorter durations of pile driving, and possibly less driving force, which would ultimately decrease the intensity of the acoustic source.

Impacts to 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 are also expected, though the type and severity of these effects are more difficult to define due to limited studies addressing the behavioral effects of impulsive sounds on marine mammals. Potential effects from impulsive sound sources can range from brief acoustic effects such as behavioral disturbance, tactile perception, physical discomfort, slight injury of the internal organs and the auditory system, to death of the animal (Yelverton et al. 1973; O'Keeffe and Young 1984; Navy 2001).

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 impacts include hearing loss, which is caused by exposure to perceptible sounds. Severe damage from a pressure wave to the ear can include rupture of the tympanum, fracture of the ossicles, damage to the cochlea, hemorrhage, and cerebrospinal fluid leakage into the middle ear (NOAA Fisheries Service 2008). Moderate injury implies partial hearing loss. Permanent hearing loss, or permanent threshold shifts (PTS), can occur when the hair cells are damaged by one very loud event or by prolonged exposure to noise. Instances of temporary threshold shifts (TTS) and/or auditory fatigue are well documented in marine mammal literature as being one of the primary avenues of acoustic impact. Temporary loss of hearing sensitivity (TTS) has been documented in controlled settings using captive marine mammals exposed to strong sound exposure levels at various frequencies (Ridgway et al. 1997; Kastak et al. 1999; Finneran et al. 2005), but it has not been documented in wild marine mammals exposed to pile driving. While injuries to other sensitive organs are possible, they are less likely because pile-driving impacts are almost entirely acoustically mediated, unlike explosive sounds, which also include a shock wave that can result in damage.

No physiological responses are expected from pile-driving operations occurring during the Project, for several reasons. First, vibratory pile driving, which is being utilized as the primary installation method, does not generate high enough peak SPLs that are commonly associated with physiological damage. Any use of impulsive pile driving would only occur from a short period of time (~30 to 120 minutes per steel pile). Additionally, the mitigation measures that the Navy would be employing (see Section 11) would greatly reduce the chance that a marine mammal may be exposed to SPLs that could cause physical harm. The Navy would have trained biologists monitoring a shutdown zone equivalent to the Level A Harassment zone (inclusive of the 180 dB re 1 μ Pa (cetaceans) and 190 dB re 1 μ Pa (pinnipeds) isopleths (contour lines) to ensure no marine mammals are injured.

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 (National Research Council of the National Academies 2005).

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al. 2003/04). 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 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 (NRC) 2003; Wartzok et al. 2003/04).

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, but also including pile driving) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; CALTRANS 2001, 2006; also see reviews in Gordon et al. 2004; Wartzok et al. 2003/04; and Nowacek et al. 2007). Responses to continuous noise, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds.

With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short-term changes in the animal's typical behavior and/or avoidance of the affected area. A marine mammal may show signs that it is startled by the noise and/or may swim away from the sound source and avoid the area. Other potential behavioral changes could include increased swimming speed, increased surfacing time, and decreased foraging in the affected area. Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (CALTRANS 2001, 2006). Since pile driving would likely only occur for a few hours per day and over a short period of time, it is unlikely to result in permanent displacement. Any potential impacts from pile-driving activities could be experienced by individual marine mammals but would not cause population level impacts or affect the long-term fitness of a species.

7.1.2 Airborne Noise Effects

Marine mammals that occur in or near the Project area could be exposed to airborne sounds associated with pile-driving that have the potential to cause harassment, depending on their distance from pile-driving activities. Airborne pile-driving noise would have less impact on cetaceans than pinnipeds because noise from atmospheric sources does not transmit well underwater (Richardson et al. 1995); thus

airborne noise would be an issue only for hauled-out pinnipeds in or near the Project area. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater noise. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon their habitat and move farther from the source. Studies by Blackwell et al. (2004) and Moulton et al. (2005) indicate a tolerance or lack of response to unweighted airborne sounds as high as 112 dB peak and 96 dB rms. Based on these observations, pinnipeds could exhibit temporary behavioral reactions to airborne noise; however, exposure is not likely to result in population-level impacts.

There are no known haul-out sites for any seal species within the vicinity of the Project area. The closest known seal haul-out site to the Project area is on the Piscataqua River 1.5 miles downstream of the Project area. Therefore, acoustic disturbance to hauled-out pinnipeds is unlikely.

7.1.3 Conclusions Regarding Impacts to Species or Stocks

Individual marine mammals may be exposed to SPLs during pile driving, and extraction operations at the Shipyard may result in Level B Behavioral harassment. Any marine mammals that are taken (harassed) may change their normal behavior patterns (i.e., swimming speed, foraging habits, etc.) or be temporarily displaced from the area of construction. Any takes would likely have only a minor effect on individuals and no effect on populations. The sound generated from vibratory pile driving is non-pulsed (e.g., continuous), which is not known to cause injury to marine mammals. Mitigation is likely to avoid most potential adverse underwater impacts to marine mammals from impact pile driving. Nevertheless, some level of impact is unavoidable. The expected level of unavoidable impact (defined as an acoustic or harassment “take”) is described in Sections 5 and 6. This level of effect is not anticipated to have any detectable adverse impact on population recruitment, survival, or recovery (i.e., no more than a negligible adverse effect).

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8 Impact on Subsistence Use

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

This section is not applicable. The Project would take place in the coastal Atlantic Ocean of Maine--specifically, the Piscataqua River. No traditional subsistence hunting areas are within the region.

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9 Impacts on the 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.

9.1 Pile-driving and Drilling Effects on Potential Prey (Fish)

Fish are a primary dietary component of the cetaceans and pinnipeds discussed in this application. Similar to marine mammals, fish can also be affected by noise both physiologically and behaviorally. However, the amount of information regarding impacts on fish from human-generated acoustic sources is limited. The acoustic threshold criteria for physiological impacts on fish were developed by the Fisheries Hydroacoustic Working Group (FHWG) in 2008. The criteria determined by the FHWG is based on impacts from pile driving; however, it is assumed that because this is the most current information for any physiological acoustic impacts on fish, the criteria can be used for other human-generated sound sources. The FHWG determined that potential injury for all fish species is based on dual criteria: (1) Peak SPL of 206 dB re 1µPa, and (2) 187 dB accumulated SEL (dBcSEL; re 1µPa2-sec) for fish weighing 2 grams or more or 183 dB accumulated SEL (dBcSEL; re 1µPa2-sec) for fish weighing 2 grams or less (Palmer 2012). To assess behavioral disturbance, NOAA Fisheries Service has adopted a threshold criterion of 150 dB re 1µPaRMS for fish of all sizes (Palmer 2012).

Construction activities will produce both pulsed (i.e., impact pile driving) and continuous (i.e., vibratory pile driving) sounds. Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short-duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005; Popper and Hastings 2009) identified several studies that suggest fish may relocate to avoid certain areas of noise energy. Sound pulses at received levels of 160 dB re 1 µPa may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Chapman and Hawkins 1969; Pearson et al. 1992; Skalski et al. 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality (CALTRANS 2001; Longmuir and Lively 2001). The most likely impact to fish from pile-driving activities at the Project area would be temporary behavioral avoidance of the immediate area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. In addition, it should be noted that the area in question is low-quality habitat since it is already highly developed and experiences a high level of anthropogenic noise from normal Shipyard operations and other vessel traffic. In general, impacts on marine mammal prey species are expected to be minor and temporary.

9.2 Pile-driving and Drilling Effects on Potential Foraging Habitat

During the course of the Project, various activities are expected to disturb the sediment. These activities include pile-driving, dredging, and filling. In order to minimize the amount of debris, sediment, and silt escaping when backfill ing the Berth 11 bulkhead, the Navy will install geotextile fabric against the interior of the bulkhead to catch debris, sediment, and silt forced through seams in the bulkhead when the backfill is compacted. In addition, a temporary silt curtain and boom would be installed outside of Berth 11, approximately 18 feet off the berth, during backfilling to catch additional debris, sediment, and silt that escapes the bulkhead.

Pile-driving and dredging activities may re-suspend disturbed sediment and result in turbid conditions within the immediate Project area. Suspended sediments may be transported and re-deposited downstream of the prevailing currents, which could increase siltation in the vicinity of the Shipyard. Resulting

sedimentation is also expected to be localized and temporary. 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 within the temporary offshore workspace 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 cetacean or pinniped prey fish species in the Project area. However, turbidity plumes associated with the Project would be temporary and localized, and fish in the 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 Great Bay Estuary. As a result, activity at the Project site would be inconsequential in terms of its effects on marine mammal foraging.

9.3 Summary of Impacts on Marine Mammal Habitat

All marine mammal species using habitat near the Project area are primarily transiting the area; no known foraging or haul-out areas are located within 1.5 miles of the 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 temporary impacts on benthic invertebrate species, another marine mammal prey source. Benthic invertebrates that are commonly prey for marine mammals, such as squid species, were not detected during a 2014 benthic survey of the Project area (CR Environmental, Inc. 2014). Direct benthic habitat loss would be avoided to the extent practicable by minimizing the construction footprint, and this loss would be temporary across most of the Project area as disturbed areas are expected to recolonize with a similar benthic community composed of organisms or offspring of organisms from adjacent benthic areas.

Construction of the bulkhead at Berth 11 would result in permanent loss of benthic habitat. This permanent loss would be insignificant on a landscape-scale, given the abundant habitat in the surrounding estuary system that is of similar or better quality. Indirect impacts on benthic habitat and organisms are likely to result from turbidity and resulting sedimentation caused by dredging activities. There would be temporary and minor direct and indirect adverse impacts on benthic habitat and benthic invertebrate species during construction as a result of sediment disturbance, turbidity, and sedimentation. However, the impacts that would result from the proposed activities would be similar to those resulting from maintenance dredging at the Shipyard. Within a short time after construction is complete, the benthic habitat would be expected to return to pre-construction conditions, allowing the recolonization of benthic invertebrates.

Given the short daily duration of noise associated with individual pile driving and removal and the relatively small areas being affected, pile-driving and extraction activities associated with the Proposed Action are not likely to have a permanent, adverse effect on any Essential Fish Habitat (EFH) or population of fish species. Therefore, pile driving and removal are not likely to have a permanent, adverse effect on marine mammal foraging habitat at the Project area.

10 Anticipated Impacts of Loss or Modification of Habitat

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

During the course of the Project, various activities would cause benthic disturbance. These include dredging, pile driving, pile extraction, and filling. These activities would not result in the significant permanent loss or modification of habitat for marine mammals or their prey. The greatest impact on marine mammals associated with the Project would be the potential minimal and temporary loss of habitat due to elevated noise levels and the potential temporary impact on prey species due to turbidity. These temporary impacts are discussed in detail in Section 9.0, Anticipated Impact on Habitat.

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11 Means of Effecting the Least Practicable Adverse Impacts – 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 exposures outlined in Section 6 represent the maximum expected number of marine mammals that could be exposed to acoustic sources reaching Level B harassment levels. The Navy proposes to employ a number of mitigation measures, discussed below, in an effort to minimize the number of marine mammals potentially affected.

11.1 Mitigation for Pile-driving Activities

11.1.1 Proposed Measures

The modeling results for ZOIs discussed in Section 6 were used to develop mitigation measures for pile driving, drilling, and extraction at Berth 11. The ZOIs effectively represent the mitigation zone that would be established to prevent Level A harassment to marine mammals.

1. **Shutdown and Buffer Zone during Pile Driving and Removal**

   - During pile driving and removal, the shutdown zone shall include all areas where the underwater SPLs are anticipated to equal or exceed the Level A (injury) harassment criteria for marine mammals (180 dB rms isopleth for cetaceans; 190 dB rms isopleth for pinnipeds). During all pile-driving and removal activities, regardless of predicted SPLs, the entire Level A zone, or shutdown zone, will be monitored to prevent injury to marine mammals from their physical interaction with construction equipment during in-water activities. Pile-driving or removal operations will cease if a marine mammal approaches the zone. Pile-driving/removal operations will restart once the marine mammal is visibly seen leaving the Level A zone, or after 15 minutes have passed with no sightings.
   - During pile-driving and removal, the buffer zone shall include areas where the underwater SPLs are anticipated to equal or exceed the Level B (disturbance) harassment criteria for marine mammals (underwater: 160 dB rms isopleths for impact pile driving, 120 dB rms isopleth for vibratory pile-driving). The distance encompassing these zones will be adjusted to accommodate any difference between predicted and measured sound levels.
   - Due to the increased costs associated with monitoring the entire Level B zone, or buffer zone, the zone will be monitored during two-thirds of all pile-driving days . If a marine mammal is observed entering the buffer zone, an exposure would be recorded and behaviors documented. The Navy will extrapolate data collected during monitoring days and extrapolate and calculate total takes for all pile-driving days.
   - All buffer and shutdown zones will initially be based on the distances from the source that were predicted for each threshold level.

2. **Shutdown Zone during Other In-water Construction or Demolition Activities**

   - During all in-water construction or demolition activities having the potential to affect marine mammals, in order to prevent injury from physical interaction with construction equipment, a shutdown zone of 33 feet will be implemented to ensure marine mammals are not present within this zone. These activities could include, but are not limited to: 1) the movement of a barge to the construction site, or 2) the removal of a pile from the water column/substrate via a crane (i.e., a "dead pull").

3. **Visual Monitoring**

   - Impact Installation: Monitoring will be conducted within the Level A harassment shutdown zone during all pile-driving operations and the Level B harassment buffer zone during two-thirds of pile-driving days. Monitoring will take place from 15 minutes prior to initiation through 30 minutes post-completion of pile-driving/removal activities.
   - A minimum of two marine species observers will be in place during all pile-driving/removal operations. Marine species observers ("observer(s)") designated by the contractor will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to equipment operators. The observer(s) shall have no other construction-related tasks while conducting monitoring and will be trained on the observation zones, potential species, how to observe, and how to fill out the data sheets by the Navy Natural Resources Manager prior to any pile-driving activities.
   - The Navy shall conduct a pre-construction briefing with the contractor. During the briefing, all contractor personnel working in the Project area will watch the Navy's Marine Species Awareness Training video. An informal guide will be included with the monitoring plan to aid in identifying species if they are observed in the vicinity of the Project area.
   - Prior to the start of pile-driving/removal activity, the shutdown and safety zones will be monitored for 15 minutes to ensure that they are clear of marine mammals. Pile-driving will only commence once observers have declared the shutdown zone clear of marine mammals; animals will be allowed to remain in the buffer zone and their behavior will be monitored and documented.
   - If a marine mammal approaches/enters the shutdown zone during the course of pile-driving/removal operations, 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 passed without re-detection of the animal.
   - In the unlikely event of conditions that prevent the visual detection of marine mammals, such as heavy fog, activities with the potential to result in Level A or Level B harassment will not be initiated. Impact pile-driving would be curtailed, but vibratory pile driving or extraction would be allowed to continue if such conditions arise after the activity has begun.

4. **Acoustic Measurements.** Acoustic measurements will continue during subsequent years of in-water construction for the Project and will be used to empirically adjust the shutdown and buffer zones. For further detail regarding our acoustic monitoring plan, see Section 13.

5. **Soft Start.** The use of a soft-start procedure is believed to provide additional protection to marine mammals by providing a warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. The Project will use soft-start techniques (ramp-up/dry fire) recommended by NOAA Fisheries Service for impact and vibratory pile driving/removal. These measures are as follows:

   "Soft start must be conducted at beginning of day's activity and at any time pile driving has ceased for more than 30 minutes. If vibratory pile driving has been occurring but impact has not for more than 30 minutes, soft start for the impact hammer must occur. The soft-start requires contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by a 30-second waiting period. This procedure should be repeated two additional times. If an impact hammer is used, contractors are required to provide an initial set of three strikes from the impact hammer at 40 percent energy, followed by a 30-second waiting period, then two subsequent 3-strike sets."

   The 30-second waiting period is proposed based on the Navy's recent experience and consultation with NOAA Fisheries Service on a similar project at Naval Base Kitsap at Bangor (Department of the Navy 2010b).

6. **Daylight Construction**. Pile driving/removal (vibratory as well as impact), drilling, and vibratory extraction will only be conducted during daylight hours.

11.1.2 Measures Considered but not Proposed

The use of bubble curtains to reduce underwater sound from impact pile driving was considered but is not proposed because the piles would be installed in relatively deep water, and strong tidal currents (up to 3 knots) at the Project sites would disperse the bubbles and compromise the effectiveness of sound attenuation (CALTRANS 2009). Other considerations were that the potential for Level A exposures and the number and relative intensity of Level B exposures has already been reduced by primary reliance on vibratory installation of steel piles--in itself, an accepted mitigation measure to reduce the intensity of underwater sound from pile driving (CALTRANS 2009).

11.2 Mitigation Effectiveness

It should be recognized that although marine mammals will be protected from Level A harassment by marine mammal observers (MMOs) monitoring the near-field injury zones, mitigation may not be 100-percent effective at all times in locating marine mammals in the buffer zone. The efficacy of visual detection depends on several factors, including the observer's ability to detect the animal, the environmental conditions (visibility and sea state), and monitoring platforms.

All observers utilized for mitigation activities will have training in marine mammal detection and behavior. Due to their specialized training, the Navy expects that visual mitigation will be highly effective. Trained observers 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 Project area are generally excellent. Located in Portsmouth Harbor, the area is sheltered from large swells and infrequently experiences strong winds. Observers will be positioned in locations that provide the best vantage point(s) for monitoring, such as on nearby piers or on a small boat, and the shutdown and buffer zones cover relatively small and accessible areas of the lower Piscataqua River. As such, proposed mitigation measures are likely to be very effective.

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12 Minimization of Adverse Effects on Subsistence Use

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

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

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

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

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

This section is not applicable. There is not subsistence use of marine mammal species or stocks in the Project area.

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13 Monitoring and Reporting Measures

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

13.1 Monitoring Plan

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 IHA. A marine mammal monitoring plan will be developed further and submitted to NOAA Fisheries Service for approval well in advance of the start of construction during the IHA period. The monitoring plan will include the following components: acoustic measurements and visual observations.

The Navy intends to complete marine mammal and acoustic surveys of the Project area in order to provide a more robust assessment of sound levels from steel pile driving and marine mammal responses, and to refine avoidance and minimization measures as warranted by the results. For all in-water activities, the monitoring described below would be implemented. The Navy would conduct post-project surveys as well on a quarterly basis to document any changes in populations of marine mammals.

13.2 Reporting Plan

The Navy will implement in situ acoustic monitoring efforts to measure SPL from in-water construction activities. The Navy will collect and evaluate acoustic sound record levels for 10 percent of the pile-driving activities conducted, sufficient to confirm measured contours associated with the acoustic ZOIs. Acoustic sound recordings will be collected sufficient to document sound source levels for 10 percent of the proposed piles to be driven and extracted.

The Navy will conduct acoustic monitoring at the source (33 feet) and, where the potential for Level A harassment exists, at a second representative monitoring location at an intermediate distance between the cetacean and pinniped shutdown zones. In conjunction with measurements of SPLs at the source and shutdown monitoring locations, there will also be intermittent verification for impact driving or pile driving and extraction to determine the actual distance to either the 120 dB re 1μPa rms isopleth or the point at which the SPL (maximum rms) from the equipment diminishes to the median ambient SPL (rms) and hence becomes indistinguishable. For the 10 percent of 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 NOAA Fisheries Service's most recent guidance for the collection of source levels.
- Hydroacoustic monitoring will be conducted for 10 percent of each different type of pile and each method of installation and removal. Monitoring will occur at source (33 feet); at a location intermediate of the pinniped and cetacean shutdown ZOIs; and occasionally

near the predicted ZOIs for Level B (behavioral) harassment. The resulting data set will be analyzed to examine and confirm sound pressure levels and rates of transmission loss for each separate in-water construction activity. With NOAA Fisheries Service's concurrence, these metrics will be used to recalculate the limits of injury and disturbance zones, 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 to maintain a constant depth and distance from the pile. The nylon cord or chain will be attached to a float or tied to a static line.

- 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.
- For each monitored location, a single hydrophone will be suspended midway in the water column in order to evaluate site specific attenuation and propagation characteristics that may be present throughout the water column.
- In addition to determining the area encompassed by the 190, 180, 160, and 120 db rms isopleths for marine mammals, hydrophones would also be placed at other distances as appropriate to accurately capture source levels and spreading loss.
- For each pile monitored, underwater SPLs would be continuously measured for the entire duration of pile driving, including soft starts. Sound pressure levels will be monitored in real time.
- 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 foot for the piles monitored.
- For acoustically monitored piles, data from the continuous 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. 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, minimum, and maximum rms pressure level in [dB re 1 μPa]
  - mean duration of a pile strike (based on the 90% energy criterion)
  - number of hammer strikes
  - mean, minimum, and maximum single strike SEL in [dB re μPa2 sec]
  - cumulative SEL as defined by the mean single strike SEL + 10*log (# hammer strikes) in [dB re μPa2 sec]

- 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.
- 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 log10 taken of result to express in [dB re µPa2 sec].

13.2.1 Visual Marine Mammal Observations

The Navy will collect sighting data and behavioral responses to construction for marine mammal species observed in the region of activity during the period of construction. All observers will be trained in marine mammal identification and behaviors. NOAA Fisheries Service requires that the observers have no other construction-related tasks while conducting monitoring.

13.2.2 Methods of Monitoring

The Navy will monitor the shutdown zone and safety zone before, during, and after pile-driving activities. Based on NOAA Fisheries Service requirements, the Marine Mammal Monitoring Plan would include the following procedures:

- MMOs will be primarily located on boats, docks, and piers at the best vantage point(s) in order to properly see the entire shut down zone(s).
- MMOs 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 MMO, relative to known distances to objects in the vicinity of the MMO;
- Bearing to animals will be determined using a compass;
- At the beginning of each survey phase (pre-construction, during construction, and post-construction), a census of pinniped species hauled out in the vicinity of pile driving encompassing the Level B 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 shutdown zone;
- Pre-Activity Monitoring:
  - The shutdown and buffer zones will be monitored for 15 minutes prior to in-water construction/demolition activities. If a marine mammal is present within the shutdown zone, the activity will be delayed until the animal(s) leave the shutdown zone. Activity will resume only after the MMO has determined that, through sighting or by waiting approximately 15 minutes, the animal has moved outside the shutdown zone. If a marine mammal is observed approaching the shutdown zone, the MMO who sighted that animal will notify the shutdown MMO of its presence.

- During Activity Monitoring:
  - If a marine mammal is observed entering the buffer zone, that pile segment will be completed without cessation, unless the animal enters or approaches the shutdown zone, at which point all pile-driving activities will be halted. If an animal is observed within the shutdown zone during pile driving, then pile driving will be stopped as soon as it is safe to do so. Pile driving can only resume once the animal has left the shutdown zone of its own volition or has not been re-sighted for a period of 15 minutes.
- Post-Activity Monitoring:
  - Monitoring of the shutdown and buffer zones will continue for 30 minutes following the completion of the activity.

13.2.3 Data Collection

NOAA Fisheries Service requires that the MMOs use NOAA Fisheries Service-approved sighting forms. NOAA Fisheries Service requires that, at a minimum, the following information be collected on the sighting forms:

- Date and time that pile driving or removal begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters identified in the acoustic monitoring (e.g., wind, 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;
- 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.

13.3 Reporting

A draft report would be submitted to NOAA Fisheries Service within 45 calendar days of the completion of acoustic measurements and marine mammal monitoring. The results would be summarized in graphical form and include summary statistics and time histories of sound values based upon the data from the piles monitored for this IHA period. A final report would be prepared and submitted to the NOAA Fisheries Service within 30 days following receipt of comments on the draft report from the NOAA Fisheries Service. At a minimum, the report shall 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 13.1.1 above) for each
  - 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 monitoring zones or in the immediate area surrounding monitoring 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 safety zones.
  - A refined take estimate based on the number of marine mammals observed during the course of construction

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14 Research

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

To minimize the likelihood that impacts will occur to the species, stocks, and subsistence use of marine mammals, all construction activities will be conducted in accordance with all federal, state, and local regulations, and minimization measures proposed by the Navy will be implemented to protect marine mammals. The Navy will coordinate all activities with the relevant federal and state agencies. These include, but are not limited to: the NOAA Fisheries Service, U.S. Fish and Wildlife Service, U.S. Coast Guard, and the U.S. Army Corps of Engineers (USACE). The Navy will share field data and behavioral observations on all marine mammals that occur in the Project area. Results of each monitoring effort will be provided to NOAA Fisheries Service in one summary report within 45 days of the conclusion of monitoring. This information could be made available to regional, state, and federal resource agencies, scientists, professors, and other interested private parties upon written request to NOAA Fisheries Service.

Additionally, the Navy provides a significant amount of funding and support for marine research. The Navy provided $26 million in Fiscal Year 2008 and $22 million in Fiscal Year 2009 to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to study marine mammals.

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

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

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

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