RETURN TO SER AR INDEX

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
FIVE POST OFFICE SQUARE – SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

October 31, 2012

Christine Vaccaro
Section 7 Coordinator
National Marine Fisheries Service
Northeast Regional Office
Protected Resources Division
55 Great Republic Drive
Gloucester, MA 01930-2276

Re: New Bedford Harbor-South Terminal Project

Dear Ms. Vaccaro:

EPA will be issuing a Final Determination on the Commonwealth of Massachusetts' Request to include construction of the proposed marine South Terminal Project in New Bedford Harbor as part of the State Enhanced Remedy. Based on discussions with staff from the Protected Resources Division, we understand that Atlantic Sturgeon may be present in the project area. Thus, EPA's issuance of the Final Determination constitutes a federal action that may affect a listed species under the Endangered Species Act. The intent of this letter is to initiate consultation under Section 7 of the Endangered Species Act of 1973, as amended, and provide our biological assessment and conclusions regarding potential effects of the project on the Atlantic Sturgeon.

Proposed Project

The Commonwealth proposes to construct a 28 acre marine terminal in New Bedford Harbor to support marine commerce and as a staging area for the construction of offshore wind turbines. The construction of this facility will also require extensive dredging and the construction of a Confined Aquatic Disposal (CAD) cell for the isolation/disposal of contaminated sediments (Figure 1).

Atlantic Sturgeon

There have been no recorded sightings of Atlantic Sturgeon in New Bedford Harbor. Atlantic sturgeon have been known to utilize the nearby Taunton River for spawning. It is our understanding from discussions with NMFS that sturgeon eggs, larvae and juveniles are not expected to occur within New Bedford Harbor, but sub-adult and adult

SDMS Doc ID 523888

sturgeon could use the area for foraging. If sturgeon did use New Bedford Harbor, it would most likely be from March to November.

In-Water Activities that Could Impact Atlantic Sturgeon

There are 3 distinct in-water activities that have the potential to impact Atlantic sturgeon. These activities are blasting, dredging and pile driving. Each activity is described below with all mitigative measures.

Blasting

EPA will not approve the use of blasting to remove rock in the Final Determination for this project. If the Commonwealth ultimately determines that blasting is absolutely required, it will need to seek modification of EPA's Determination, and EPA will reinitiate consultation with NMFS.

Dredging

The proposed project will result in the immediate dredging of approximately 45 acres (and a potential for an additional 10 acres of dredging) of the seafloor (Figure 1). Dredging is proposed to begin in January and continue for approximately 7 months. Thus, dredging will occur during the time of year when Atlantic sturgeon could be present.

To mitigate potential impacts to Atlantic sturgeon and other fishery resources, EPA will require the following measures:

1. The use of an environmental bucket for dredging of fine grained materials;
2. The implementation of turbidity monitoring with action levels, which may trigger the use of silt curtains or other engineering controls;
3. The use of a series of barriers that will form the basis of a fish exclusion system around the project area. The Commonwealth will erect silt barriers that will be anchored to the bottom and build a bubble curtain to encircle the project area. In addition, weir nets will be deployed outside of these barriers to provide a second obstacle to benthic fish movement. These fish exclusion devices will be deployed prior to construction begins in January and will remain in place until June 15th to protect winter flounder spawning.; and
4. A fish monitoring program will be instituted for the project area during the period of time when the fish exclusion devices are in place. On a weekly basis, the Commonwealth will monitor for the presence of fish in the project area. If fish are present, multiple fish startle systems will be deployed in an attempt to get the fish to move out of the project area.

Pile Driving

The construction of this facility calls for the installation of a 1,000 linear foot coffer dam, followed by the installation of 175 z-shaped steel sheet piles and 181 pipe piles. To construct the coffer dam, 3,034 thin flat steel sheets approximately 19" long and 0.5" thick will be installed. The z-shaped pile sheets are 30" long and 3/8" thick. Sixty five of the pipe piles are 24" diameter and have a 5/8" wall thickness. One hundred and sixteen of the pipe piles are 30" in diameter and have a wall thickness of ¾". Construction of this facility will occur during the time of year when Atlantic sturgeon could be present in the project area.

To mitigate potential impacts to Atlantic sturgeon primarily from noise impacts associated with pile driving, EPA will require the following measures:

1. To eliminate the need to pound piles into bedrock, a "rock socket" installation method will be used for 87 of the piles. This technique involves drilling a "rock socket" in place, placing the piling in the hole and then grouting it in place. This technique is consistent with the "drill and pin to ledge" criteria that NMFS has previously suggested.
2. Limiting the installation methods to the use of vibratory hammers for the installation of piles.

On October 22, 2012, the Commonwealth submitted to EPA its Biological Assessment for the Atlantic Sturgeon, which is included as an attachment to this letter. EPA has not had sufficient time or opportunity to review the details of the acoustic model used to generate results for this assessment. In addition, we do not concur with the assessment's premise that Atlantic sturgeon could only occur within a handful of narrowly defined habitat areas within New Bedford Harbor. However, some useful conclusions can still be drawn from this assessment:

1. Potential acoustic impacts would be primarily limited to behavioral (avoidance) effects.
2. Potential acoustic impacts seem to be limited to an area surrounding the project site that represent less than approximately 1/3 of the cross-sectional area of the river. This leaves ample room for fish passage.
3. From the initiation of construction in January through June 15, a large percentage of the zone of potential acoustic impact will already be blocked off with fish exclusion devices (silt curtains, bubble curtains and fish weirs) designed to keep benthic fish out of the project zone. During that period of time, sturgeon will be physically shielded from a large part of the area that could cause them harm.
4. Bubble curtains can be employed as an effective means of minimizing the potential area of impact.

Conclusion

EPA has based its final conclusion on discussions with NMFS and information provided by the Commonwealth. EPA concludes that, although the proposed NBH-South Terminal project has the potential to affect the Atlantic sturgeon, due in large part to the limited presence of the sturgeon in the area and the mitigative measures that will be employed, the project is unlikely to adversely affect the species. If you have any questions on this letter, please contact me at (617) 918-1506.

Sincerely,

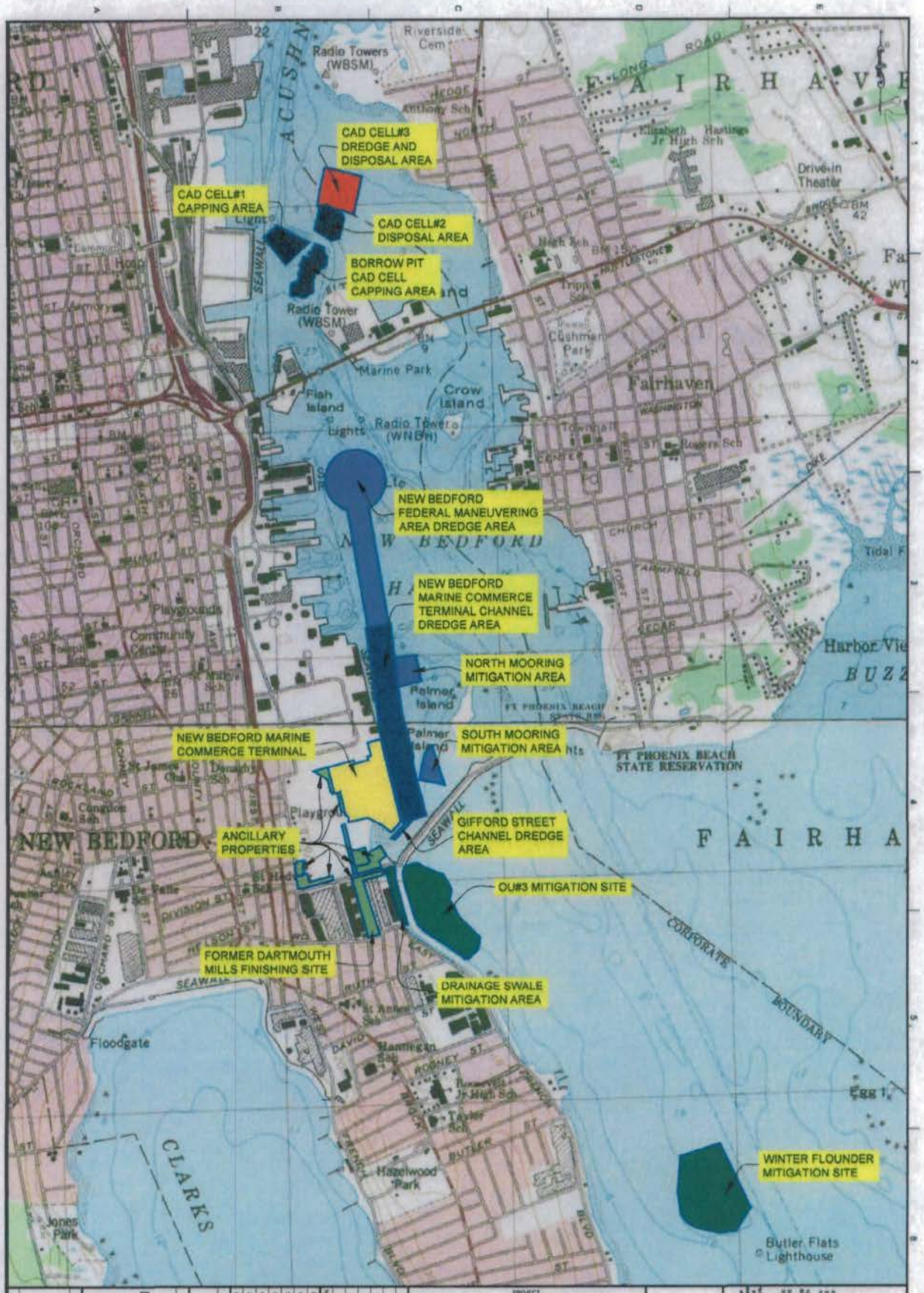
Phil Colarusso

Phil Colarusso, Marine Biologist
Coastal and Ocean Protection Section

cc: Gary Davis, Mass EOEA
Paul Diodati, Mass DMF
Kathryn Ford, Mass DMF

EPA Draft Determination for the Proposed South Terminal Project
New Bedford Harbor State Enhanced Remedy

Figure 1
Map of Proposed Work Components
(Second map attached to show existing upland asphalt cap
in white striped area)



1	NEW BEDFORD MARINE COMMERCE TERMINAL GENERAL SITE PLAN	GRAPHIC SCALE 0 300 600 1200	PROJECT: NEW BEDFORD MARINE COMMERCE TERMINAL
GROUND NO.		SHEET TITLE	OWNER: MASSACHUSETTS CLEAN ENERGY CENTER, 55 SUMMER STREET, 9TH FLOOR, BOSTON, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

APEX

Biological Assessment for the Atlantic Sturgeon, *Acipenser oxyrinchus oxyrinchus*

New Bedford Marine Commerce Terminal
New Bedford, Massachusetts

Prepared By:

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Date: October 22, 2012

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1 Introduction

Section 7 of the Endangered Species Act (ESA,16 USC 1531 et seq.) mandates that all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the federal agency determines that an action may adversely affect a federally listed species, consultation with National Marine Fisheries Service (NMFS) is required to ensure that the action will not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. If it is determined that a proposed federal action is likely to result in the "take" of a listed species, then NMFS may describe those conditions which must be met in order for an activity to proceed. "Take" includes harming or harassing a species in ways which interfere with its normal breeding, feeding, or sheltering behaviors.

This Biological Assessment (BA) was prepared to comply with Section 7 of the ESA, as outlined above, to assess potential impacts of construction and long-term operation of the proposed New Bedford Harbor (NBH) South Terminal Project in New Bedford, MA, on Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Atlantic sturgeon are divided into five distinct population segments (DPSs), which were federally listed as endangered (New York Bight DPS, Chesapeake Bay DPS, Carolina DPS, South Atlantic DPS) or threatened (Gulf of Maine DPS) on February 6, 2012. Although New Bedford Harbor is not designated as critical habitat for any federally species listed under the ESA, the project area may provide potential forage habitat for juvenile and adult Atlantic sturgeon from any of the five DPSs (NMFS letter, June 19, 2012).

2 Description of Project and Action Area

The following sections provide a description of the project and the portion of New Bedford Harbor where the project is proposed (i.e. action area).

2.1 Project Description

The Commonwealth of Massachusetts (hereafter Commonwealth) proposes to construct an approximately 28-acre marine commerce terminal (South Terminal) within the Designated Port Area of New Bedford Harbor at a site north of the harbor's hurricane barrier (Figure 1). The purpose of the terminal is to provide critical infrastructure to serve offshore renewable energy facilities, and to accommodate domestic and international shipping. The project is described in detail in the State Enhanced Remedy in New Bedford, South Terminal (MassDEP, 2012a), submitted January 18, 2012, and the Response to USEPA Comments on the January 18, 2012 Submission by the Commonwealth of Massachusetts for the New Bedford Marine Commerce Terminal (MassDEP, 2012b0, submitted June 18, 2012.

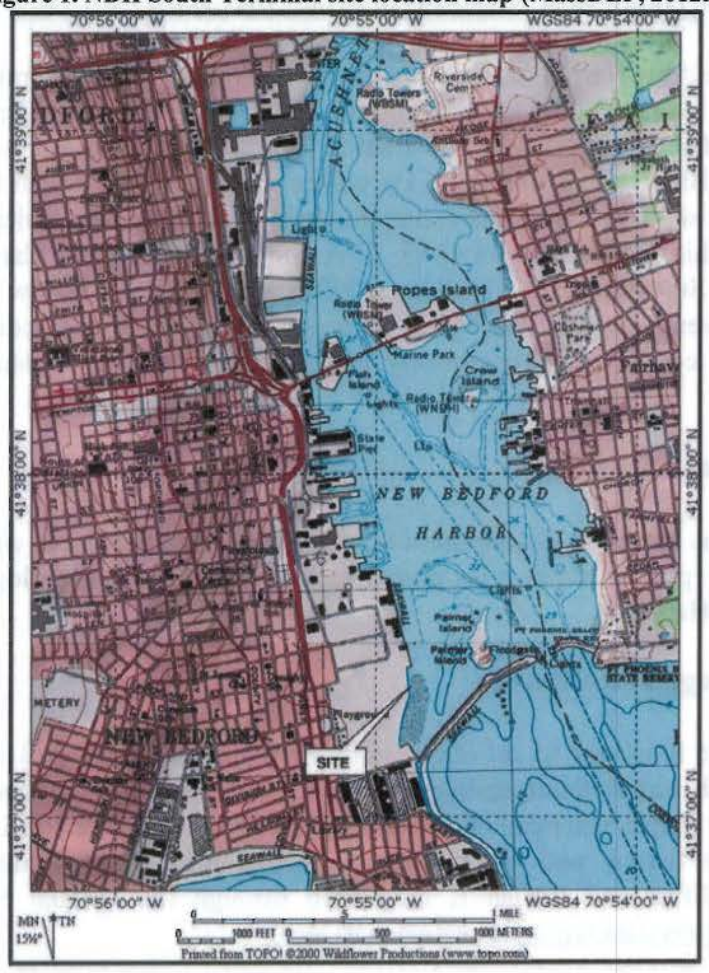
In summary, the project includes the following construction activities in waters of the United States (U.S.):

- Dredging to create a channel, from the existing Federal navigation channel to the facility, to accommodate vessel travel to the new terminal;
- Dredging to relocate two existing vessel mooring areas and the Gifford Street boat channel;
- Construction of a confined aquatic disposal (CAD) cell for disposal of contaminated sediments below the ocean floor;
- Construction of a confined disposal facility (CDF) for disposal of sediments above the ocean floor to create the upland terminal structure;

- Construction of approximately 1,000 linear feet of bulkhead, and utilization of 200-feet of existing South Terminal bulkhead (for a total facility bulkhead length of 1,200 feet), to contain the CDF and new terminal.

The project is proposed under the State Enhanced Remedy provision of the US Environmental Protection Agency (EPA) Superfund program (CERCLA). CERCLA regulations allow for a state to petition the EPA to expand its remedial action to include additional activities as an enhancement of the remedy; for this project this includes navigational dredging and disposal of contaminated sediments in CAD cells and construction of a CDF.

Figure 1. NBH South Terminal site location map (MassDEP, 2012a).



Dredging and construction of the South Terminal project will permanently impact 22.39 acres of intertidal, near-shore subtidal, and salt marsh resource areas. Project construction will temporarily impact 36.48 acres of near-shore subtidal resources. Please refer to Section 3 below for a discussion of resources to be impacted by the South Terminal project.

2.2 Action Area

New Bedford Harbor is located on the northern shore of Buzzards Bay, and is bounded on the east by Fairhaven and the west by New Bedford. The Acushet River flows into the bay from the north, and is the most significant freshwater input for the harbor (Figure 1).

New Bedford Harbor is classified into three regions: (1) Upper, north of Cogshell Street Bridge, (2) Lower (or Inner), between Cogshell Street Bridge and New Bedford Hurricane Barrier, and (3) Outer, south of New Bedford Hurricane Barrier. The South Terminal and CDF, CAD cell, and dredging areas are within the Lower (Inner) Harbor, which is bounded on the north by the Acushet River and the south by the hurricane barrier.

Currently, the inner harbor is characterized by a commercial fishing fleet, recreational vessel fleet, fish processing and cold storage facilities, commercial shipping facilities, a ferry and cruise ship terminal, vessel maintenance and repair facilities, several marinas, and historical attractions. Land use along the shoreline is a mixture of industrial, commercial, and residential uses (MassDEP, 2012a).

Historically, New Bedford Harbor was characterized by industrial and commercial uses, including textile mills and electronics industries that resulted in the contamination of harbor sediments with polychlorinated biphenyls (PCBs) and heavy metals. Contamination extends from the upper Acushet River to Buzzards Bay to varying degrees. Bioaccumulation of PCBs within the aquatic food web has resulted in closure of the harbor to fishing and shellfishing. PCB contamination has also led to restrictions in recreational activities and development within the harbor. In 1983, EPA added New Bedford Harbor to the National Priorities List as a designated Superfund Site (USEPA, 2012). Remediation of New Bedford Harbor by the EPA through dredging to remove and containment to sequester contaminated sediments began in 2004, and to date has removed or contained approximately 200,000 cubic yards of contaminated sediments (USEPA, 2012).

3 Environmental Setting

The following sections provide a description of the environmental setting in which the New Bedford Marine Commerce Terminal project shall take place, inclusive of subtidal biological resources and physical characteristics of the Harbor.

3.1 Subtidal Biological Resources

New Bedford Harbor functions as an ocean embayment and estuary, and supports a variety of benthic invertebrates, shellfish, and finfish resources (USEPA, 2012). However, contamination of harbor sediments with PCBs and heavy metals has resulted in the closure of the Upper Harbor, Lower Harbor, and portions of the Outer Harbor to fishing and shellfishing (USEPA, 2012). Bioaccumulation of PCBs and other contaminants in shellfish and finfish is monitored through the Annual Seafood Monitoring program (http://www.epa.gov/nbh/data.html#OtherRelevantDocs).

3.1.1 Benthic Fauna

New Bedford Harbor features a diverse assemblage of benthic invertebrates, which may exhibit important variations across seasons and sites. These invertebrates provide a food source for many predatory finfish, including Atlantic sturgeon (see Section 4).

As part of the New Bedford Harbor Long Term Monitoring Program, twenty-nine (29) sampling stations are located throughout the Lower Harbor, at a range of depth, habitat, and substrate types. In 2010, 10,226 organisms from 136 species were sampled (Woods Hole Group, Inc., 2010). *Streblospio benedicti*, a polychaete worm, was the dominant species, followed by the polychaetes *Tharyx acutus* and *Leitoscoloplos* sp. Please refer to Appendix K of the 2010 Long Term Monitoring Report V for a complete species list for

New Bedford Harbor, which includes sampling data from 1993 through 2009 (Woods Hole Group, Inc., 2010).

In 2005, 14,547 organisms from 85 species were sampled (Batelle, 2005). 2005 sampling was dominated by *Mulinia laterialis*, the dwarf surf clam, followed by *S. benedictii* and oligochaete worms. The complete species list for the 2005 Long Term Monitoring Report IV can be found in Appendix 9 of that report (Batelle, 2005).

3.1.2 Shellfish Resources

Shellfish resources in New Bedford Harbor are dominated by quahog or hard clam, *Mercenaria mercenaria* (MassDEP, 2012a). Other species found within the Lower Harbor include common or eastern oyster (*Crassostrea virginica*), bay scallop (*Argopecten irradians*), soft shell clam (*Mya arenaria*), blue mussel (*Mytilus edulis*), and ribbed mussel (*Geukensia demissa*).

The project is expected to result in the mortality of approximately 9.8 million quahog and other shellfish species. A mitigation plan has been developed that includes seeding of approximately 24.5 million quahog and oysters over a 10-15 year period (NMFS letter, August 21, 2012 and Commonwealth response dated October 4, 2012).

3.1.3 Finfish Resources

Finfish resources within New Bedford Harbor are presented in detail in Section 6.4.5, Essential Fish Habitat Assessment, of the State Enhanced Remedy in New Bedford, South Terminal (MassDEP 2012a). Essential Fish Habitat (EFH) is designated for twenty (20) species within the 10 minute x 10 minute square for Atlantic Ocean waters that encompass New Bedford Harbor. Essential Fish Habitat is designated for fifteen (15) species within the Buzzards Bay Estuary/Bay/River (Table 1).

Table 1. Species for which New Bedford Harbor is designated Essential Fish Habitat by NMFS.

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults[1]
Atlantic cod (*Gadus morhua*)	X	X	X	X	
Haddock (*Melanogrammus aeglefinus*)	X	X			
Red hake (*Urophysis chuss*)		X	X	X	X
Winter flounder (*Pseudopleuronectes americanus*)	X	X	X	X	X
Windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X	X
American plaice (*Hippoglossoides platessoides*)			X	X	
Atlantic sea herring (*Clupea harengus*)			X	X	
Bluefish (*Pomatomus saltatrix*)			X	X	
Long finned squid (*Loligo pealeii*)[2]	n/a	n/a	X	X	
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X	
Atlantic mackerel (*Gadus morhua*)	X	X[2]	X[2]	X	
Summer flounder (*Paralicthys dentatus*)	X[2]	X	X	X	
Scup (*Stenotomus chrysops*)	X	X	X	X	
Black sea bass (*Centropristus striata*)	X[3]	X	X	X	
Surf clam (*Spissula solidissima*)[2]	n/a	n/a	X	X	
King mackerel (*Scomberomorus cavalla*)	X	X	X	X	
Spanish mackerel (*Scomberomorus maculates*)	X	X	X	X	
Cobia (*Rachycentron canadum*)	X	X	X	X	
Sandbar shark (*Carcharhinus plumbeus*)[2]				X	
Bluefin tuna (*Thunnus thynnus*)[2]			X		

[1] Spawning adult designation for Buzzards Bay Estuary/Bay/River only. [2] Designated within Atlantic Ocean quadrant only.
[3] Designated within Buzzards Bay Estuary/Bay/River only.

Finfish resources were also characterized by Normandeau Associates using survey data collected monthly over a one-year period (Normandeau Associates, 1999). Seine (0-1 m depth) and trawl (2-10 m depth) methods were utilized to survey the harbor for finfish resources from June 1998 through May 1999. In the Lower Harbor, one seine (NS3) and two trawls (NT4, NT5) characterized the finfish resources. Species captured through survey efforts in the Lower Harbor are listed in Table 2.

Table 2. Finfish resources captured in lower New Bedford Harbor by Normandeau Associates (1999).

Species	Seine (S) or Trawl (T)
Alewife (*Alosa psuedoharengus*)	T
American eel (*Anguilla rostrata*)	T
Atlantic herring (*Clupea harengus*)	T
Atlantic menhaden (*Brevoortia tyrannus*)	S, T
Atlantic silverside (*Menidia menidia*)	S, T
Atlantic tomcod (*Microgadus tomcod*)	S
Banded rudderfish (*Seriola zonata*)	T
Bay anchovy (*Anchoa mitchilli*)	T
Black sea bass (*Centropristus striata*)	S
Bluefish (*Pomatomus saltatrix*)	S
Crevalle jack (*Caranx hippos*)	T
Cunner (*Tautogolabrus adspersus*)	S
Fourspine stickleback (*Apeltes quadracus*)	S
Fundulus sp.	S
Grubby (*Myoxocephalus aenaeus*)	S
Gulf stream flounder (*Citharichthys arctifrons*)	T
Hake sp. (*Urophycis* sp.)	S
Mummichog (*Fundulus heteroclitus*)	S
Northern kingfish (*Menticirrhus saxatilis*)	S
Northern pipefish (*Syngnathus fuscus*)	S
Northern puffer (*Sphoeroides maculates*)	S
Oyster toadfish (*Opsanus tau*)	T
Pollock (*Pollachius virens*)	T
Rainbow smelt (*Osmerus mordax*)	T
Red hake (*Urophysis chuss*)	T
Scup (*Stenotomus chrysops*)	S
Seaboard goby (*Gobiosoma ginsburgi*)	S
Sheepshead minnow (*Cypinodon variegates*)	S
Short bigeye (*Pristigenys alta*)	T
Skate sp. (*Raja* sp.)	T
Smooth flounder (*Pleuronectes putnami*)	S
Spotted hake (*Urophycis regia*)	S
Striped bass (*Morone saxatilis*)	T
Striped killifish (*Fundulus majalis*)	S
Striped searobin (*Prionotus evolans*)	S
Summer flounder (*Paralicthys dentatus*)	T
Tautog (*Tautoga onitis*)	T
Tidewater silverside (*Menidia peninsulae*)	S
Weakfish (*Cynoscion regalis*)	T
White perch (*Morone americana*)	T
Windowpane flounder (*Scopthalmus aquosus*)	T
Winter flounder (*Psuedopleuronectes americanus*)	S, T

3.2 Physical Characteristics

New Bedford Harbor is a shallow coastal embayment characterized by open water, rocky shores, beaches, tidal creeks and marshes, and other coastal habitats. The harbor has been altered by dredging and other anthropogenic uses, including establishment and maintenance of a Federal navigation channel that extends from the hurricane barrier north to the Acushet River; development of industrial, commercial, and recreational uses that line the harbor; and construction of the hurricane barrier. Decades of industrial activity within and along the banks of the Harbor has resulted in the contamination of Harbor sediments with PCBs and heavy metal constituents to the degree that the Harbor has been declared a Superfund Site.

New Bedford Harbor has mean tidal range of approximately 3.7 ft (1.1 m) and spring tidal range of 4.6 ft (1.4 m). Water temperature in New Bedford Harbor ranges from 1.1°C (Jan/Feb) to 25.8°C (Jul/Aug) [NOAA NODC, 2012]. Salinity ranges from 19 ppt to 37 ppt, and dissolved oxygen ranges from 4.0 mg/L to 13.5 mg/L (USEPA, 2010; The Coalition for Buzzards Bay, 2012).

The Lower (Inner) Harbor is generally shallow, with depths ranging from 0 – 50 feet below mean lower low water (MLLW) [USACE, 1998]. The terminal site is characterized by shallow water (< 8' below MLLW) and coastal wetland habitats. Shallow water and various coastal habitats are present from the terminal site to Palmer Island and the western edge of the federal navigation channel. The federal navigation channel enters the Lower Harbor at the hurricane barrier, where it splits into two channels. The New Bedford Reach, authorized to a depth of -30 feet MLLW, runs through the center of the Lower Harbor and terminates with a turning basin between the western harbor shoreline and Pope's Island. A maneuvering area lies adjacent to the west side of the New Bedford Reach, also authorized to a depth of -30 feet MLLW. The Fairhaven Reach, authorized to a depth of -15 feet MLLW to Old South Wharf and then to a depth of -10 feet MLLW for the remainder of the channel, provides access to the eastern shore of the Lower Harbor and extends northeasterly to between Crow Island and the eastern shore. Adjacent to the Fairhaven Reach is an anchorage area, authorized to a depth of -25 feet MLLW (Maguire Group, Inc., 2002).

Long-term sediment and toxicity monitoring has been conducted in New Bedford Harbor as part of the Superfund monitoring program. PCB levels within the Lower Harbor range from non-detectible to 190 ppm. Higher PCB concentrations occur in shallower depths outside of the Federal navigation channel, and north of Popes Island (NBHTC, 2001). EPA Monitor Station 253 lies within the proposed South Terminal dredge area, and has been monitored since 1993. Sediment characteristics for this station include PCB concentrations that average 5.7 ppm and an average silt/clay content of 46.9% (MassDEP & MassDMF, 2010). Sampling conducted as part of the South Terminal project indicates that sediments within the footprint the project facility contain PCBs up to approximately 20 ppm. Note that the US Food and Drug Administration (FDA) criterion for PCB concentrations in commercial seafood is 2.0 ppm.

Harbor circulation conditions are influenced primarily by tidal currents. Currents in the Lower Harbor are weak, typically less than 0.4 knots (0.18 m/s). Bottom friction in the Lower Harbor results in small-scale eddies that create a vertically well-mixed boundary layer in deeper waters, causing sediments to remain suspended in the water column (NBHTC, 2001). The exceptions to weak Lower Harbor currents are the entrance to the hurricane barrier, where currents have been measured at 2.4 knots (122 m/s) during the flood tide, and the Coggshell Street Bridge, where currents have been measured at 3.5 knots (1.8 m/s).

4 Biology of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

The following sections provide a description of the Biology of the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*, including its life history, habitat and feeding preferences, and geographical distribution.

4.1 Life History

The Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is a long-lived, late maturing, estuarine dependent, anadromous finfish species. Atlantic sturgeon spawn in freshwater river systems, but otherwise spend the majority of their adult life in marine ecosystems (Dunton et al., 2010; ASSRT, 2007; Beamesderfer & Farr, 1997; Gilbert, 1989).

Spawning takes place from April – May in mid-Atlantic systems and May – July in Canadian systems. Atlantic sturgeon return to their natal river to spawn every 1-5 years (male) and 2-5 years (female). Females migrate back out to coastal waters immediately after spawning, while males remain in spawning ground through the season. Sturgeon spawn in flowing water between the salt front and fall line of large rivers, where flows are high due to spring runoff. Eggs are highly adhesive and are deposited on the bottom on hard substrates such as cobble (ASSRT, 2007; Beamesderfer & Farr, 1997). Hatching occurs 94-140 hours after eggs are deposited (ASSRT, 2007; Gilbert, 1989).

The yolksac larval stage, from hatching to 31.5 mm total length (TL), is completed in 8-12 days, during which time the larvae migrate downstream to rearing grounds. Larval migration is limited to night during the first half of this migration downstream, and daylight is spent using benthic structure, such as gravel or cobble, as refuge. As larvae develop, migration expands to daylight hours (ASSRT, 2007). Young-of-the-year (YOY) sturgeon, 31.5 mm – 41 cm TL are also dependent on bottom substrate for refuge from predators.

Juvenile sturgeon continue the downstream migration into brackish and then estuarine waters, where they become residents for months to years. At approximately 76-92 cm TL, juvenile or sub-adult sturgeon move to coastal waters and may undertake long-range migrations throughout sub-adult and adult life stages. Data suggests that Atlantic sturgeon migrate south along the coast to North Carolina to Virginia during winter months, with return migration to northern waters in the spring prior to spawning season (Dunton, et al., 2010; Fox & Breece, 2010; Gilbert, 1989).

Age at maturity for Atlantic sturgeon varies, with faster growth and earlier age at maturation for southern populations. Average age at maturity for females is 15 years or 197 cm TL (ASSRT, 2007).

4.2 Habitat and Feeding Preferences

New Bedford Harbor has been identified as possible habitat for sub-adult and adult life stages of Atlantic sturgeon (NMFS letter, August 21 2012). This assessment shall therefore focus on the habitat parameters for these life stages. Juvenile and sub-adult terminology is often interchanged in the literature concerning Atlantic sturgeon. For this report, sub-adult shall be defined as any juvenile or sub-adult sturgeon that is not considered a YOY (≤ 41 cm TL) or mature adult (ASSRT, 2007).

4.2.1 Depth

Sub-adult and adult Atlantic sturgeon occupy shallow coastal waters adjacent to estuaries. Capture of sub-adult and adult Atlantic sturgeon typically occurs at depths of 10-50 m dominated by gravel and sand substrates (ASSRT, 2007; Dunton, et al., 2010; Laney, et al., 2007; NRDC, 2009; Stein et al., 2004).

Dunton et al. (2010) analyzed abundance and distribution of Atlantic sturgeon using fishery-independent survey data from 1973 – 2007, and concluded that depth is the primary parameter defining distribution of Atlantic sturgeon. Analysis revealed that the majority of Atlantic sturgeon captured in trawl surveys from Maine to North Carolina were sub-adults aggregating around the mouths of estuaries and along a narrow migration corridor in waters less than 20 m deep from Cape Hatteras (NC) to the south shore of Long Island (NY).

Laney et al. (2007) synthesized data from winter tagging cruises from 1988 – 2006 off the coasts of Virginia and North Carolina, and found that sturgeon were captured at depths ranging from 9.1 – 21.3 m (30 – 70 ft). Stein et al. (2004) used fishery data from 1989 – 2000 to categorize habitat for Atlantic sturgeon as depths of 10-50 m dominated by gravel and sand substrates.

Higher concentrations of Atlantic sturgeon are associated with coastal features such as inlets and the mouths of bays (Dunton, et al., 2010; Fox & Breece, 2010, Stein et al., 2004). Coastal features identified as areas where Atlantic sturgeon aggregate include Bay of Fundy, Kennebec River, Massachusetts Bay, Rhode Island, Hudson River-NY Bight, New Jersey, Delaware Bay, Chesapeake Bay, Cape Hattaras (Dunton, et al., 2010; Fox & Breece, 2010, Stein et al., 2004). The reason for higher concentration of sturgeon in these areas is not known, but it is theorized that abundance of preferred prey in these areas is a key factor. Tidal outflow plumes have physical and biological characteristics that appear to influence distribution of sturgeon in these areas, including increased prey base (Stein et al., 2004).

4.2.2 Water Quality

Atlantic sturgeon sub-adults inhabit waters with temperatures of 13.2 – 28 °C, moving to deeper, cooler waters during summer months (Musick, 2005). Studies have shown that Atlantic sturgeon sub-adults will avoid temperatures greater than 28°C (Niklitschek & Secor, 2005). Atlantic sturgeon adults occupy coastal waters with temperatures typically ranging from 13 – 24 °C (Dunton, et al., 2010).

Sub-adult sturgeon inhabit waters with salinities ranging from brackish (5-25 ppt) to marine (> 25 ppt), while adults mainly inhabit marine waters except during spawning season. Both sub-adults and adults avoid regions of hypoxia, where dissolved oxygen is < 4.0 mg/L.

4.2.3 Feeding Habits

Atlantic sturgeon are benthic omnivores, feeding on a variety of invertebrates and small fish by rooting along the bottom, sucking in large quantities of mud and prey. They compete for prey with other benthic predators, including suckers (*Moxotoma* sp.), winter flounder (*Pseudopleuronectes americanus*), tautog (*Tautoga onitis*), cunner (*Tautagolabrus adspersus*), porgies (Sparidae), croakers (Sciaenidae) and stingrays (*Dasyatis* sp.) [ASSRT, 2007].

Sub-adults feed mainly on aquatic insects and invertebrates; adults expand their diets to include mollusks, gastropods, amphipods, isopods and small fish, especially sand lances (*Ammodytes* sp.) [ASSRT, 2007; Murawski & Pacheco, 1977; NRDC, 2009; Smith, 1985]. Distribution of sub-adult and adult sturgeon is correlated with prey base. Sturgeon will often forage at or near mudflats with areas of submerged aquatic vegetation (SAV) or shellfish resources. Although no SAV beds are present in the project area, the presence of benthic invertebrates and shellfish resources in the Lower Harbor has led resource scientists to suggest that the area should be evaluated as foraging habitat for sub-adult and adult sturgeon.

4.3 Geographical Distribution

Atlantic sturgeon are distributed from Hamilton Inlet on the coast of Labrador to the Saint Johns River in Florida (ASSRT, 2007; Dunton, et al., 2010, Stein et al., 2004). Records confirm that spawning historically occurred in 35 rivers of the U.S., from St. Croix, ME to Saint Johns River, FL. Closest to New Bedford Harbor, historic spawning populations of Atlantic sturgeon existed in the Taunton River (RI and MA) until the early 20th century, but only a handful of non-natal sub-adults and adults have been recorded since (ASSRT, 2007). Currently, Atlantic sturgeon spawn in an estimated 20 U.S. rivers. The closest confirmed spawning river to the New Bedford Harbor project area is the Hudson River in New York (NRDC, 2009). For this reason, the New Bedford Harbor project area is not considered habitat for spawning adults and early life stages of Atlantic sturgeon.

Given the habitat preferences and migration patterns outlined above for Atlantic sturgeon, NMFS has asserted the possibility that sub-adult or adult sturgeon from any of the five ESA listed distinct population segments (DPSs) of Atlantic sturgeon may forage in New Bedford Harbor from April – October (NMFS letter, August 21 2012). To assess the potential impacts of this project on sub-adult and adult Atlantic sturgeon, a literature and data review of surveys and abundance estimates for New Bedford Harbor and Buzzards Bay, located to the south of New Bedford Harbor, was performed.

The only finfish resource survey conducted in New Bedford Harbor was performed by Normandeau Associates (1999) from June 1998 to May 1999. Surveys were conducted monthly using seine (0-1 m depth) and trawl (2-10 m depth) methods. No Atlantic sturgeon were recorded.

Massachusetts Division of Marine Fisheries (DMF) was consulted regarding known occurrences of Atlantic sturgeon in New Bedford Harbor based on other data sources. Massachusetts DMF stated that Atlantic sturgeon have never been recorded in New Bedford Harbor, and that the Harbor is not considered habitat by their sturgeon experts (Kathryn Ford, MassDMF New Bedford Office, via telephone call October 9, 2012).

Massachusetts DMF (King et al., 2010) synthesized data from trawl surveys conducted throughout waters of Massachusetts from 1978 – 2007 to develop a comprehensive list of species recorded by region. New Bedford Harbor and Buzzards Bay are within Region 1 of the DMF trawl surveys. Trawl surveys were conducted in Region 1 in May and September at depths of ≤ 30 ft, 30-60 ft, 60-90 ft, and 90-120 ft. Atlantic sturgeon were not recorded in any Region 1 trawl survey.

Camisa & Wilbur (2002) conducted trawl surveys in Buzzards Bay for the Buzzards Bay Dredge Material Management Plan (DMMP) Draft Environmental Impact Report (DEIR). Surveys were conducted using an otter trawl in March 2001, twice monthly from April – October 2001, and once monthly from November 2001 – March 2002. Atlantic sturgeon were not captured in any trawl.

Stone et al. (1994) synthesized literature and data to assess distribution and abundance of fishes and invertebrates in mid-Atlantic estuaries, inclusive of Atlantic sturgeon. Spatial distribution, temporal distribution, and relative abundance was estimated for Atlantic sturgeon in Buzzards Bay. Atlantic sturgeon sub-adults and adults are listed rare in Buzzards Bay throughout the year. Rare is defined as "species is definitely present by not frequently encountered." In addition to assessing each species, the reliability of the conclusions was determined. For Atlantic sturgeon in Buzzards Bay, the data reliability is listed as "reasonable inference", defined as "little or no data available. Information on distribution, ecology, and preferred habitats documented in similar estuaries."

Finally, the FishBase (Froaese & Pauly, 2011) database for occurrences of Atlantic sturgeon was also reviewed. No Atlantic sturgeon have been recorded in New Bedford Harbor or Buzzards Bay from 1878 – present.

In summary, based on all available data, Atlantic sturgeon have never been recorded in New Bedford Harbor. Atlantic sturgeon have also never been recorded in Buzzards Bay, where they would be more likely to occur as the bay is proximal to known coastal foraging and migratory habitat. Therefore, New Bedford Harbor should not be considered as migratory or foraging habitat that is utilized by sub-adult or adult Atlantic sturgeon.

5 Analysis of Potential Effects of the Proposed Action

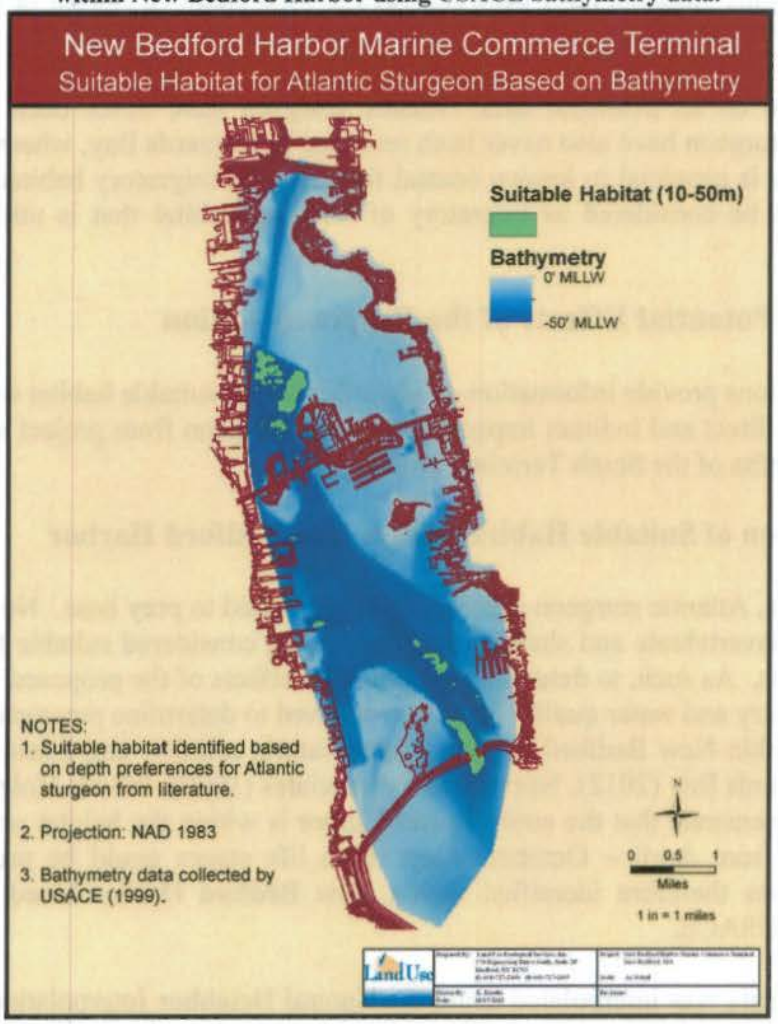
The following sections provide information on identification of suitable habitat within New Bedford Harbor, and assessment of direct and indirect impacts to Atlantic sturgeon from project activities, and discussion of the ecological benefits of the South Terminal project.

5.1 Identification of Suitable Habitat within New Bedford Harbor

As discussed above, Atlantic sturgeon distribution is correlated to prey base. New Bedford Harbor contains sufficient benthic invertebrate and shellfish resources to be considered suitable forage habitat for sub-adult and adult life stages. As such, to determine the potential effects of the proposed action on Atlantic sturgeon resources, bathymetry and water quality data was reviewed to determine parameters to be utilized to identify suitable habitat within New Bedford Harbor. Temperature, salinity, and dissolved oxygen data from The Coalition for Buzzards Bay (2012), Normandeau Associates (1999), Woods Hole Group (2010), and NOAA NODC (2012) demonstrate that the entire Lower Harbor is within the habitat range for sub-adult and adult Atlantic sturgeon from April – October, when these life stages could be present according to NMFS. Suitable habitat was therefore identified within New Bedford Harbor based on 1998 bathymetry data obtained from the USACE.

Bathymetry point data was interpolated using the Natural Neighbor Interpolation Tool (Spatial Analyst) in ArcMap 10 to develop a surface raster for the entire Lower Harbor. Bathymetry in the Lower Harbor ranges from -50.7 feet – 0 feet MLLW (-15.5 – 0 m MLLW). Based on habitat parameters identified in NRDC (2009), ASSRT (2007), and Stein et al. (2004), areas with water deeper than -32.8 feet (10m) MLLW were extrapolated to identify suitable habitat for Atlantic sturgeon sub-adults and adults within New Bedford Harbor (Figure 2). As depicted in Figure 2, there are only small pockets, all within the federal navigation channel and maneuvering area north of Pope's Island, wherein suitable depths exist for Atlantic sturgeon in the lower New Bedford Harbor project area. Suitable habitat identified represents less than 2% of the harbor area.

Figure 2. Suitable habitat areas for Atlantic sturgeon sub-adults and adults within New Bedford Harbor using USACE bathymetry data.



Although small areas of suitable habitat have been identified within the New Bedford Harbor Federal navigation channel, based on bathymetry and depth preferences for sub-adult and adult Atlantic sturgeon, it is highly unlikely that Atlantic sturgeon sub-adults or adults migrate to waters within the Lower Harbor, as sturgeon would need to cross large stretches of unsuitable habitat to reach these areas. As discussed in Section 4 above, sub-adult and adult sturgeon typically inhabit shallow coastal waters, conducting long-distance migrations along the coast within a depth corridor of 10 – 50 m. Higher concentrations of these life stages are associated with open bays and coastal areas, such as Massachusetts Bay (open bay) and coastal Rhode Island. Inland migration only occurs during spawning runs into large freshwater rivers, and the Acushet River is not spawning habitat for Atlantic sturgeon. Therefore, although New Bedford Harbor has small areas of adequate depth within the Federal navigation channel, and prey base to support foraging sub-adult and adult Atlantic sturgeon, it should not be considered as habitat that is utilized by this species.

5.2 Direct Impacts

The following sections summarize potential direct impacts to Atlantic sturgeon, including the potential for physical impacts and acoustic impacts, from the proposed South Terminal project.

5.2.1 Physical Impacts

Atlantic sturgeon are susceptible to entrainment in dredge drag-arms, impeller pumps, hydraulic pipelines, and bucket-and-barge dredge operations (ASSRT, 2007). Studies have shown, however, that sub-adult and adult sturgeon avoid dredge project areas during construction (ASSRT, 2007).

Dredging associated with the South Terminal project is not expected to impact Atlantic sturgeon, as dredging is proposed outside of the areas identified in Section 5.1 as suitable habitat (Figure 1). Placement of dredge spoil in the CAD cells north of Pope's Island will overlap small areas identified as suitable habitat. However, as stated above, New Bedford Harbor should not be considered habitat utilized by Atlantic sturgeon due to its generally shallow depths and distance from the coastal migratory corridor. Furthermore, sturgeon would need to cross large stretches of unsuitable habitat to reach these areas. Finally, Atlantic sturgeon have never been recorded or observed in New Bedford Harbor. Therefore, no direct, physical impacts to Atlantic sturgeon are expected from the South Terminal project.

5.2.2 Acoustic Impacts

In-water construction activities, such as the pile driving, dredging and use of non-explosive rock removal methods, and (potential) use of explosives proposed for the South Terminal project, generate sound that has the potential for negative effects on Atlantic sturgeon. Several studies have documented the effects of in-water construction activities such as pile driving and use of explosives on various species of finfish. Effects range from behavioral (startle response, avoidance), to physiological (stress, temporary or permanent hearing loss, structural and cellular damage of auditory and non-auditory tissues), to lethal (Normandeau Associates, 2012; Caltrans, 2009; Popper & Hasting, 2009; Hastings & Popper, 2005; Yelverton et al., 1975).

NMFS utilizes two sets of criteria to assess potential impacts of in-water sound producing activities on fish, one for non-explosive sound and one for use of explosives. Criteria for injury to fish from pile driving activities were established by the Fisheries Hydroacoustic Working Group (FHWG, 2008). NMFS Northeast Region has adopted these criteria, summarized in Table 3 below.

Table 3. Criteria for assessment of impacts on Atlantic sturgeon from pile driving and non-explosive rock removal.

Threshold	Level
Onset of Injury: Peak	206 dB re 1 μPa
Onset of Injury: Cumulative	187 dB re 1 $\mu Pa^2 \cdot s$
Behavioral Effects	150 dB_{RMS}

For blasting activities, NMFS does not have formal acoustic guidelines or protective criteria for fish. NMFS provided the Commonwealth with the guidelines summarized in Table 4 for use in this acoustic modeling exercise, based on a study performed by Moser (1999) to assess acoustic impacts on juvenile shortnose sturgeon (*Acipenser brevirostrum*) and striped bass (*Morone saxatilis*).

Table 4. Criteria for assessment of impacts on Atlantic sturgeon from use of explosives.

Threshold	Level
Onset of Injury: Peak Pressure Level	75.6 psi
Onset of Injury: Peak Impulse Level	18.4 psi•msec

To determine potential effects of the South Terminal project in-water construction activities on Atlantic sturgeon, JASCO Applied Sciences (Dartmouth, Nova Scotia) conducted an acoustic modeling study of the

project site to determine sound levels in New Bedford Harbor that may result from pile-driving, non-explosive rock removal, and use of explosives for rock removal. Site location for each model scenario was based on a worst-case scenario, i.e. the location where sound propagation would extend farthest from the source.

Interpretation of the modeling results to assess potential impacts to Atlantic sturgeon is provided in the following sections.

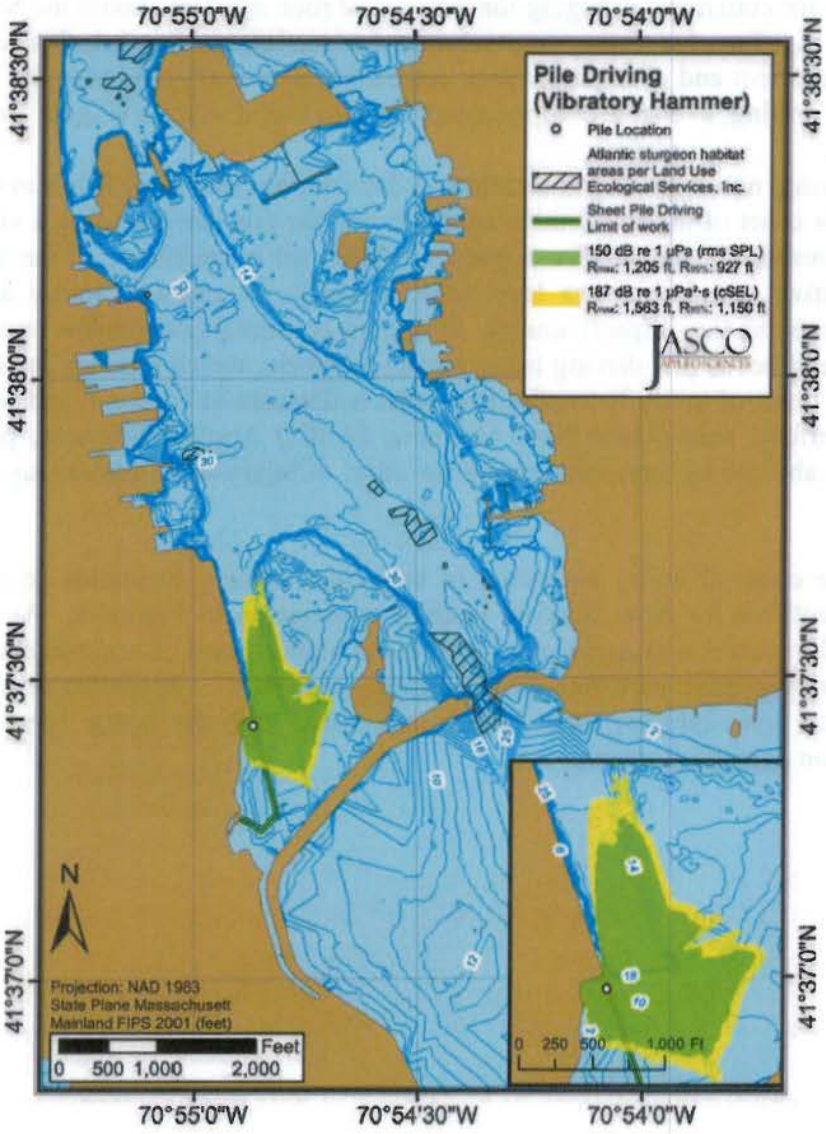
5.2.2.1 Vibratory Pile Driving

Pile-driving for the South Terminal project will be performed using a vibratory hammer. Vibratory pile driving produces a continuous sound with peak pressures lower than impact pile driving. Sound signals are typically a low fundamental frequency characterized by the speed of rotation of the vibratory hammer, and its higher harmonics (Normandeau Associates, 2012).

Acoustic modeling results for pile driving with a vibratory hammer are depicted in Figure 3. As shown in Figure 3, pile driving using a vibratory hammer does not produce a peak sound pressure level (SPL) above the 206 dB re 1 μPa threshold for onset of injury. Cumulative sound exposure level (cSEL) results for onset of injury are based on a threshold established for impulse (i.e. impact) sounds. Pile driving using vibratory hammers produces a continuous sound that does not have the same cumulative effect as pile driving using impact hammers, which produce impulses. It is therefore likely that the area of potential onset of injury is smaller than what is depicted in Figure 3, and would be contained within the behavioral effects area (Marie-Noel Matthew, JASCO Applied Sciences, personal communication). However, in the absence of threshold criteria for onset of injury from continuous sound, the impulse threshold value must be used.

Model results depicting areas for onset of injury and onset of behavioral effects do not overlap suitable habitat areas identified for New Bedford Harbor (Figure 3). Therefore, acoustic modeling demonstrates that pile driving using a vibratory hammer associated with the South Terminal project will have no acoustic effects on Atlantic sturgeon.

Figure 3. Acoustic modeling results for pile driving activities in New Bedford Harbor.



5.2.2.2 Dredging and Use of Non-Explosive Rock Removal Techniques

Noise produced by dredging is dependent on the type of dredge used and the sediment being dredged. Mechanical dredging, using a bucket, grab, or backhoe dredge, produces a repetitive sequence of sounds generated by winches, bucket impact with substrate, bucket closing, and bucket emptying. In addition, operation of mechanical parts of grab and backhoe dredges produces sharp transient sounds. Suction dredging, using a hopper or cutterhead dredge, produces a combination of sounds from relatively continuous sources that include the dredge engine and propeller, operation of pumps, and drag head movement along the substrate (Normandeau Associates, 2012). Substrate properties affect the production of sound with dredging activities. Dredging of sandy substrates creates less noise than dredging of rocky substrates.

A comparison of prospective sound data found in the literature indicates that the highest level of acoustic and vibrational sound (and thus the highest potential for acoustic impacts on the resource) is most likely to come from cutterhead dredge activities (Marie-Noel Matthews, JASCO Applied Sciences, personal communication). Accordingly, as the activity to have the most likely highest resource impact, the

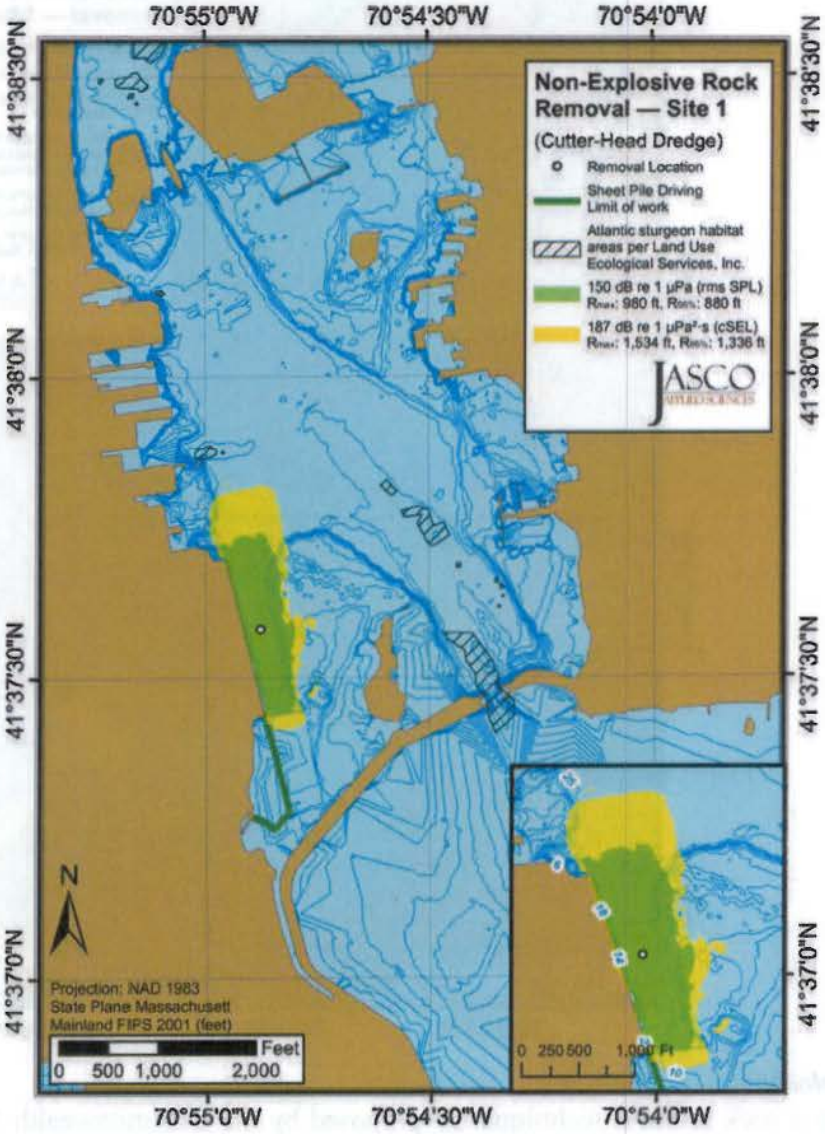
cutterhead dredge activity for the breakup of rock is the activity that was modeled for this section. Acoustic modeling results for cutterhead dredging for removal of rock associated with the South Terminal project are depicted Figure 4. Two locations were selected for modeling. Site 1 is located within the navigation channel, at the northern end of potential rock removal activities (Figure 4a). Site 2 is the same location as modeled for pile driving, to enable comparison of the two sound sources (Figure 4b).

As with pile driving, non-explosive rock removal does not produce peak levels at or above the 206 dB re 1 μPa threshold for onset of injury. Similar to the results for pile driving using a vibratory hammer (Section 5.2.2.1), model results for cumulative impacts are likely an overestimate of the actual extent for onset of injury. Cumulative sound exposure level (cSEL) results for onset of injury are based on a threshold established for impulse (i.e. impact) sounds. Dredging produces a continuous sound that does not have the same cumulative effect as pile driving using impact hammers, which produce impulses. It is likely that the area of potential onset of injury is smaller than what is depicted in Figure 4, and would be contained within the behavioral effects area (Marie-Noel Matthew, JASCO Applied Sciences, personal communication). However, in the absence of threshold criteria for onset of injury from continuous sound, the impulse value must be used.

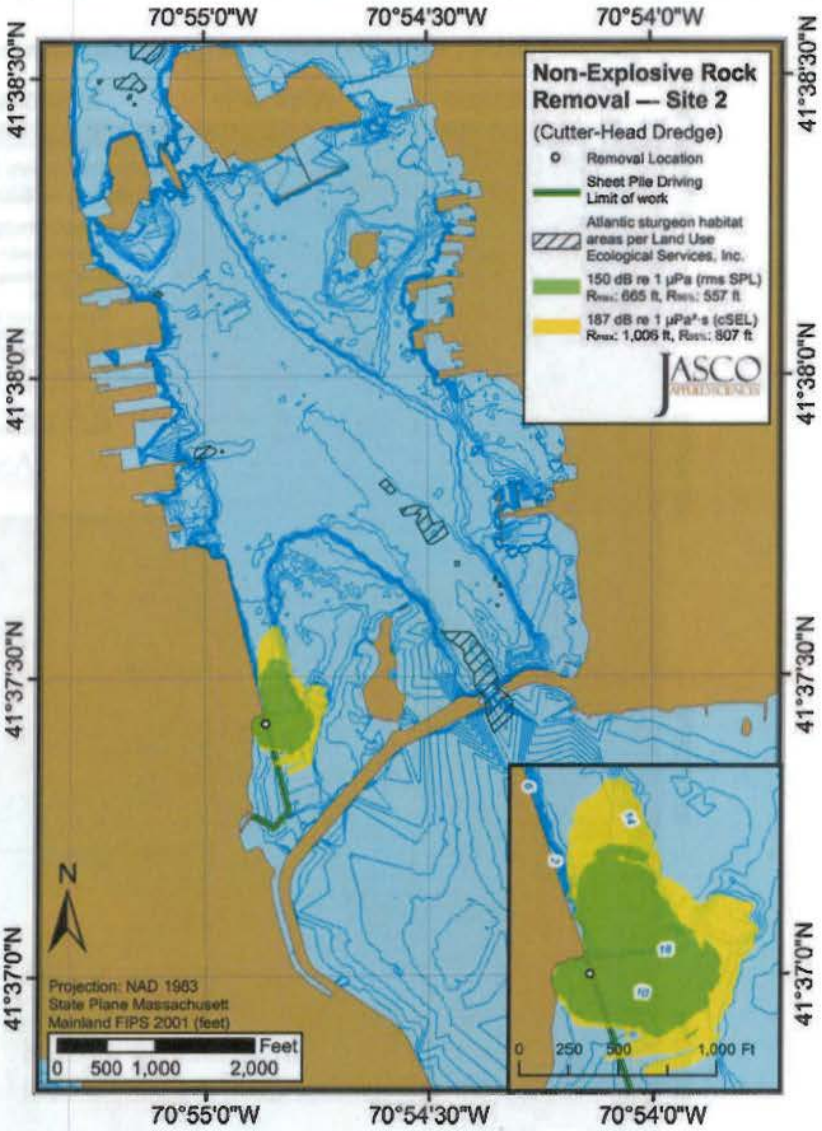
Areas within the onset of injury and onset of behavioral effects thresholds do not overlap with suitable habitat areas identified for New Bedford Harbor, as depicted in Figure 4. As stated above, cutterhead dredging for rock removal was modeled as it produces highest level of acoustic and vibrational sound of the dredging and non-explosive rock removal techniques proposed. Modeling results therefore demonstrate that dredging and non-explosive rock removal associated with the South Terminal project will have no acoustic effects on Atlantic sturgeon.

Figure 4. Acoustic modeling results for non-explosive rock removal activities in New Bedford Harbor. (a) Location #1, within the deeper navigation channel area (b) Location #2, the northern boundary of the South Terminal.

4(a) Location #1, within the deeper navigation channel area.



4(b) Location #2, the northern boundary of the South Terminal.



5.2.2.3 Explosives

Explosives as a rock removal technique are proposed by the Commonwealth for the New Bedford Harbor South Terminal project as a last resort for removal of rock if non-explosive techniques prove ineffective. If explosives are required to remove rock within the proposed navigation channel, they will be placed in a drilled shot hole beneath the floor of the Harbor and covered, which will act to attenuate the sound and acoustic energy in the water column. Additionally, separate engineering modeling of potential vibrational impacts of blasting on the New Bedford Hurricane Barrier (requested by the USACE) has also been conducted; results indicate that the size of blast charges should be limited to ≤ 50 lbs to ensure that potential blasting for the South Terminal project will not impact the hurricane barrier, which is located to the south of the project site (Figure 1). As such, the Commonwealth will be requiring that the selected contractor limit the size of blast charges to ≤ 50 lbs. In keeping with this requirement, acoustic modeling conducted for resources impacts utilized charge sizes from 10 – 50 lbs.

Underwater explosions produce a spherical shock wave with a large oscillating gas bubble that radiates sound. Pressure from underwater explosions consists of a primary pulse (shock) characterized by a rapid

rise time and exponential decay, followed by a series of bubble pulses (Normandeau Associates, 2012). Type and size of explosive charge contribute to the pressure produced by an explosive.

Acoustic modeling of explosives was performed for charge sizes of 10 – 50 lbs buried at depth as described above. Results of the model are depicted in Figures 5 and 6. Figure 5 depicts peak pressure threshold (Figure 5a) and impulse level threshold (Figure 5b) for use of explosives without mitigation. Figure 6 depicts peak pressure threshold (Figure 6a) and impulse level threshold (Figure 6b) for use of explosives coupled with use of bubble curtain(s) to mitigate potential impacts.

Figure 5. Acoustic modeling results of the use of explosives of various charge sizes for rock removal. (a) Peak pressure level threshold (left). (b) Impulse level threshold (right).

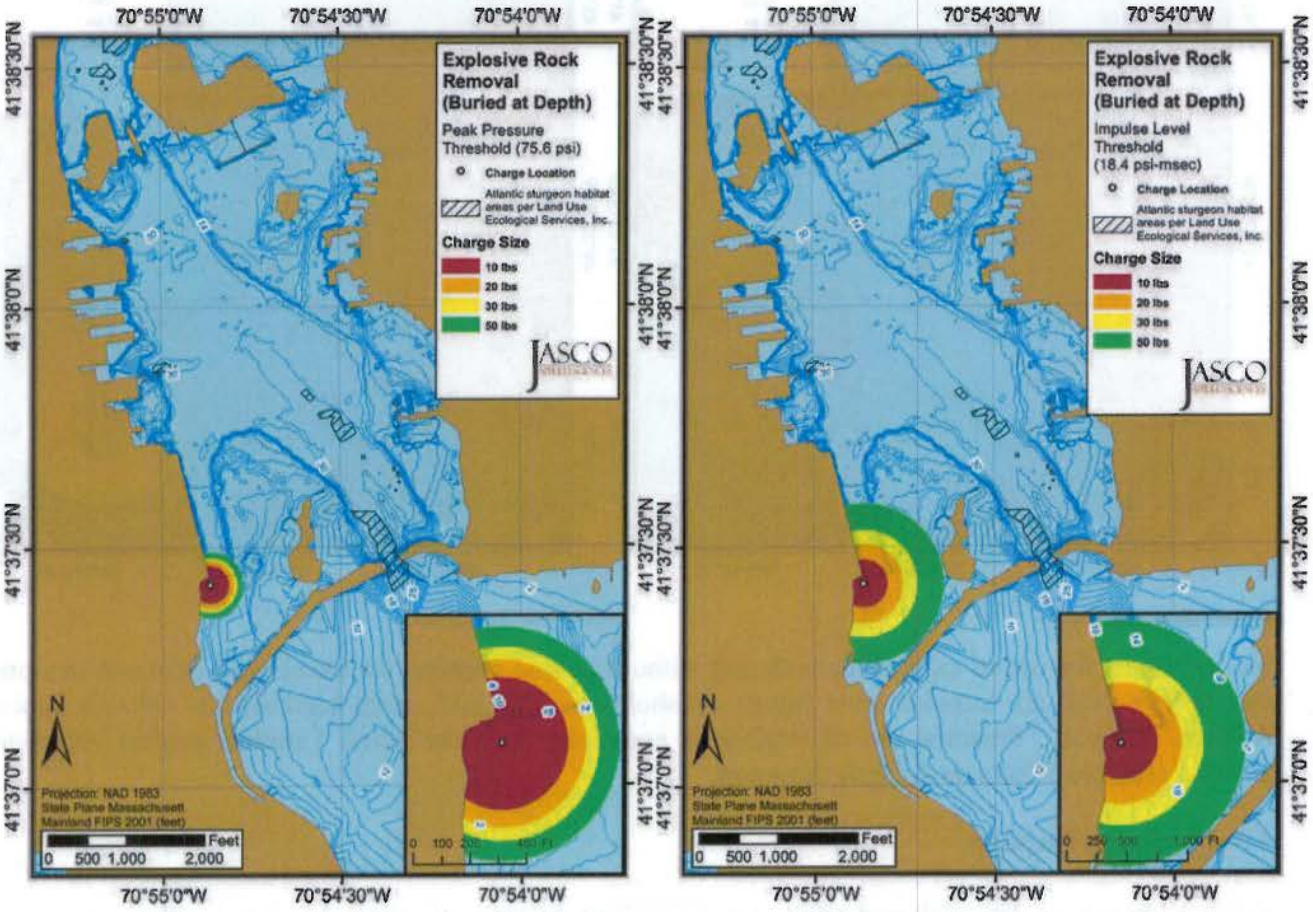
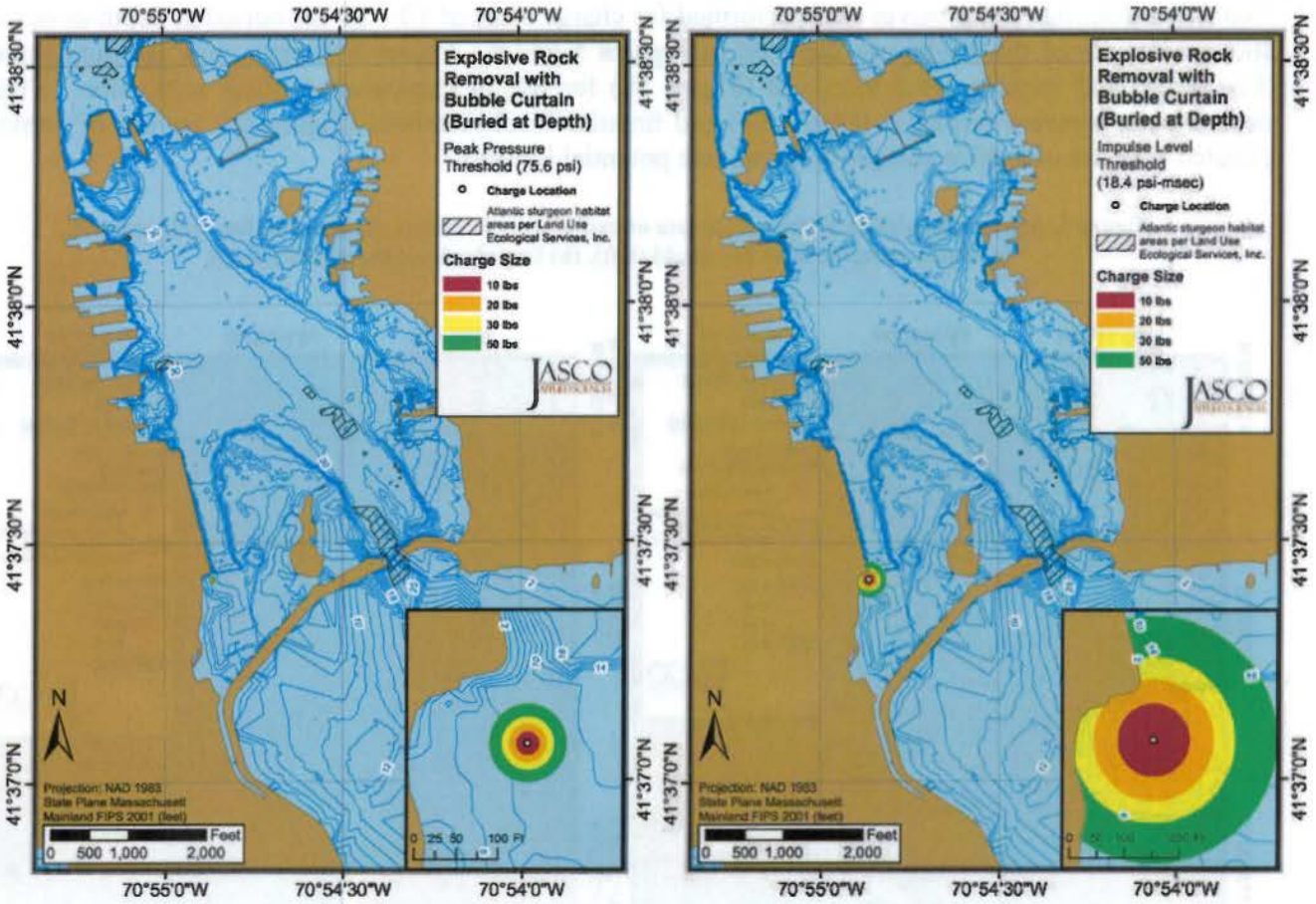


Figure 6. Acoustic modeling results of the use of explosives for rock removal with bubble curtain mitigation. (a) Peak pressure level threshold (left). (b) Impulse level threshold (right).



Model results for use of explosives with and without bubble curtains for attenuation of sound demonstrate that neither peak nor impulse level injury thresholds overlap with areas identified as suitable habitat for Atlantic sturgeon. Potential use of explosives associated with the South Terminal project will therefore have no acoustic effects on Atlantic sturgeon.

5.3 Indirect Impacts

Indirect impacts to sub-adult and adult (non-spawning) Atlantic sturgeon associated with dredging and in-water construction activities include impacts to water quality and benthic prey assemblages. Dredging and in-water construction disturbs bottom sediments, resulting in increases in turbidity during construction activities. Dredging and in-water construction also results in the destruction of benthic feeding areas of Atlantic sturgeon.

Although the benthic community will be impacted by dredging and in-water construction, New Bedford Harbor is not suitable habitat utilized by Atlantic sturgeon due to its generally shallow depths and distance from the coastal migratory corridor. As noted in Sections 4 and 5 above, Atlantic sturgeon have never been recorded or observed in New Bedford Harbor. Therefore, indirect impacts to Atlantic sturgeon are not expected from the South Terminal project.

5.4 Ecological Benefits of the Proposed Project

New Bedford Harbor is contaminated with PCBs and metals (ref. to Section 2.2). PCB contamination in finfish causes reproductive and developmental effects, including reproductive failure and mortality. Exposure to PCBs has also been shown to cause fin erosion, epidermal lesions, blood anemia, and altered immune response in finfish (ASSRT, 2007). Toxic metals may cause death or sub-lethal effects to finfish, and chronic toxicity of some metals may lead to loss of reproductive capabilities, body malformation, inability to avoid predation, and susceptibility to infectious organisms (ASSRT, 2007).

Dredging associated with the South Terminal project will reduce the levels of PCBs and metals in sediments within the areas to be dredged. Contaminated sediments will be disposed of/confined in a CAD cell as outlined in Section 2.2. Removal of contaminated sediments and disposal or confinement will reduce the future potential for finfish and benthic organisms to be exposed to these contaminants. Monitoring as part of EPA's Superfund cleanup has shown measureable decreases in PCB concentrations, and corresponding increases in benthic community conditions, for New Bedford Harbor.

6 Determination of Effects on Atlantic Sturgeon

Based on the analysis presented above, the proposed New Bedford Harbor Marine Commerce Terminal (or South Terminal) project is unlikely to adversely affect the Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*. New Bedford Harbor and the Acushnet River are not considered spawning habitat for this species, and therefore, the project will have no direct impacts on Atlantic sturgeon spawning or early life stages. In addition, the project is sufficiently distant from the closest extant spawning river for Atlantic sturgeon, the Hudson River in New York, and will therefore have no indirect impacts to spawning or nursery habitat.

The South Terminal site and associated locations of dredging and sediment placement are located in areas that are not suitable habitat for migratory sub-adult and adult Atlantic sturgeon due to shallow water depths and distance from the known coastal habitat and migratory corridor. Based on the existing literature and survey data, Atlantic sturgeon have never been observed in New Bedford Harbor, nor have they been recorded in Buzzards Bay, where they would be more likely to occur as the bay is proximal to known coastal foraging and migratory habitat. Furthermore, sub-adult and adult sturgeon avoid dredging and in-water construction activities, and so, in the unlikely event that a transient sturgeon traveled through the hurricane barrier into lower New Bedford Harbor, dredging and in-water construction activities would drive it out of the project area. Therefore, the project will have no direct effects on sub-adult or adult Atlantic sturgeon. Moreover, as New Bedford Harbor is not considered foraging habitat for Atlantic sturgeon due to shallow depths, the project will have no indirect effects on sturgeon foraging success.

7 Conclusions

The proposed New Bedford Harbor Marine Commerce Terminal project is not expected to affect the Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*.

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