

**Application for §401  
Water Quality Certificate  
BRPWP 10  
Under 314 CMR 9.00**

**Atlantic Avenue  
Reconstruction Project  
Hull, MA**

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*CHA Project Number: 25463*

***February 2021***

***Prepared for:***  
*Department of Environmental Protection  
Southeast Regional Office  
Division of Waterways  
20 Riverside Drive, Route 105  
Lakeville, MA 02347*

***Applicant:***  
*Hull Department of Public Works  
9 Nantasket Avenue  
Hull, MA 02045*

***Prepared by:***



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## **Section 1**

### ***401 Water Quality Certification Application Form BRP WW 10 – Major Project***

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Massachusetts Department of Environmental Protection  
Bureau of Resource Protection – Wetlands and Waterways  
**BRP WW 10 Major Project Certification**  
**BRP WW 11 Minor Project Certification**  
**401 water Quality Certification for Fill and excavation**  
**Projects in waters and Wetlands**

X287362

Transmittal Number #

## A. Applicant Information

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



1. Which permit category are you applying for?

☒ BRP WW 10      ☐ BRP WW 11

2. Applicant/Owner:

Town of Hull Department of Public Works

Name

9 Nantasket Avenue

Address

Hull

City/Town

MA

State

02045

Zip Code

Joseph A. Stigliani

Contact Person

-

Telephone (home)

781-925-0401

(work)

3. Authorized Agent

CHA Consulting, Inc.

Name

101 Accord Park Drive

Address

Norwell

City/Town

MA

State

02061

Zip Code

John G. Morgan, Jr.

Contact Person

-

Telephone (home)

781-982-5437

(work)





**Massachusetts Department of Environmental Protection**  
**Bureau of Resource Protection – Wetlands and Waterways**  
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## **B. Project Information**

1. Project Location:

Atlantic Avenue

Address

Hull

City/Town

MA

State

02045

Zip Code

Straits Pond/ Massachusetts Bay

Nearest or Adjacent Waterbody

2. Project Name (if any):

Atlantic Avenue Reconstruction Project

3. a. Describe project purpose:

The Hull DPW proposes to improve the Atlantic Avenue road corridor for vehicular, bicycle and pedestrian use and improve stormwater collection and discharge of treated water to Straits Pond. The majority of Atlantic Avenue is in poor condition with numerous potholes and utility trench patches. The pavement surface of the road from Nantasket Avenue/Route 228 to the Town Hall (see description below) is in fair condition and sections of roadway have been recently resurfaced during the past few years due to utility work and poor pavement. However, prior to resurfacing, there was a significant amount of map cracking and some pavement spalling along Atlantic Avenue, and the severity of the pavement failures, significant amount of patching, and areas of deformation indicate that the subbase is in poor condition. Bituminous concrete sidewalks are in very poor condition along the south side of the road for the project's entire length. Stormwater runoff along the roadway is collected by multiple closed drainage systems consisting of catch basins and manholes, although direct discharge of surface runoff to Straits Pond occurs via many outlet points/pipes from the roadway gutter and a paved waterway. See Project Narrative.

b. Is the project

☒ water-dependent

☐ non water-dependent



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**B. Project Information** (cont.)

4. a. provide a brief description of the proposed project (See Application Instructions and include a copy of the Notice of intent, if any.):

The proposed roadway reconstruction/improvements to Atlantic Avenue will occur from the Nantasket Avenue/Route 228 at the western end of the project to the Hull/Cohasset Town Line near Summit Street located at the eastern end of the project east of Straits Pond. The proposed reconstruction/related work along its approximately 1.3-mile length include: reconstruction of the existing roadway and sidewalk, improvements to the existing stormwater drainage, intersection safety modifications and enhancement of bicycle and pedestrian accommodations, new signing/curbing/guardrail replacement as applicable. See Project Narrative.

b. Notice of Intent File number (if any): SE35-1584; OoC issued 12/14/20

5. Identify the loss in square feet of each type of resource area (see Application Instructions for additional information.):

a. Bordering vegetated wetland:	<u>634 s.f. (315 s.f restoration/319 s.f replication)</u> square feet
b. Isolated vegetated wetland:	<u>-</u> square feet
c. Land under water:	<u>85 s.f. impact/85 s.f. restoration</u> square feet
d. Total cumulative loss of a. + b. + c.:	<u>-</u> square feet
e. Salt marsh:	<u>264 s.f. impact/ 327 s.f. replication/restoration</u> square feet

6. a. Will the proposed project occur in any wetlands or waters designated as "Outstanding Resource Waters"?

☒ Yes ☐ No

If yes has public notice been published in the Environmental Monitor?

☒ Yes ☐ No

Notification on 02/24/21  
Date of Publication

- |  |   |  |
|--|---|--|
| b. Is this project a subdivision or any part of a subdivision? | <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No |
| c. Is the project categorically subject to MEPA?               | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No            |
| If yes, has final action been taken?                           | <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No |
| If yes, please include copy of MEPA certificate.               |   |  |



**Massachusetts Department of Environmental Protection**  
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**B. Project information (cont.)**

**7. Alternatives Analysis:**

As related to the project purpose, attach a detailed description of alternatives to the proposed project that were considered and why none are available that avoid adverse impacts to wetlands and waters.

If no alternatives are available, describe how the activity will minimize or mitigate the adverse impacts to wetlands and waters.

See application instructions for information required. Attach required documentation.

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**C. Additional Information**

1. Is any of your proposed work exempt from the Massachusetts Wetlands Protection Act or taking place in a federal non-state wetland?

☐ Yes ☒ No

If yes, see Application Instructions for additional information needed.

2. Public notice to a newspaper of general circulation within the area of the proposed activity must be published within 10 days of the date of this application. Is proof of public notice submitted?

☒ Yes ☐ No

(See Application Instructions for additional information)

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**D. Certification**

Application is hereby made for water quality certification.

"I certify that I am familiar with the work proposed and that to the best of my knowledge and belief the information contained in this application is true, complete, and accurate"

  
Applicant's Signature

Joseph A. Stigliani

Print name

  
Agent's Signature

John G. Morgan, Jr.

Print Name

02/05/21

Date

## Section 2

### *Project Narrative*

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## PROJECT NARRATIVE

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### 2.1 INTRODUCTION

On behalf of the Town of Hull Department of Public Works (DPW) and Massachusetts Department of Transportation – Highway Division (MassDOT), CHA Consulting, Inc. (CHA) is filing this §401 Water Quality Certificate (§401 WQC) application (BRP WW 10) for a major fill/excavation project with the Department of Environmental Protection (Department) in accordance with the Clean Water Act, 33 USC 1251, and the Massachusetts Clean Water Act, MGL Chapter 21, sections 26 -53 under the regulatory authority 314 CMR 9.00. The proposed roadway reconstruction/improvements to Atlantic Avenue within the Town of Hull (See Figures 1 & 2– Locus Maps) will be performed by the Massachusetts Department of Transportation – Highway Division (MassDOT) and occurs will occur from Nantasket Avenue/Route 228 at the western end of the project to the Hull/Cohasset Town Line near Summit Street located at the eastern end of the project east of Straits Pond. Atlantic Avenue is designated as an Urban Minor Collector and proposed reconstruction and related work along its approximately 1.3-mile length include: roadway reconstruction, improvements to the existing stormwater drainage system, intersection safety modifications and enhancement of bicycle and pedestrian accommodations, new signing, striping, curbing and guardrail replacement where necessary. Selective clearing and thinning are proposed to maintain clear zones and intersection sight distance.

The project is being filed as a BRP WW 10 Major Project according to 314 CMR 9.00. Proposed work associated with reconstruction/improvements to Atlantic Avenue will result in alteration of salt marsh/bordering vegetated wetland (BVW) as well as land under salt ponds/intertidal zone below MHW as discussed below. This work will occur within/adjacent to Straits Pond that is part of the Weir River Area of Critical Environmental Concern (ACEC) and is designated as an Outstanding Resource Water (ORW).

The proposed work also qualifies as a limited project under the Wetlands Protection Act (WPA) 310 CMR 10.24(7)(c)1. – *Maintenance and improvement of existing public roadways, but limited to widening less than a single lane, adding shoulders, correcting substandard intersections, and improving drainage systems*, and requires a Notice of Intent (NOI) to be filed with the Hull Conservation Commission and Massachusetts Department of Environmental Protection (MassDEP). The roadway design has been developed to avoid and/or reduce impacts to wetland resource areas to the greatest extent practicable. Proposed roadway improvements will occur within WPA resources: coastal beach, coastal bank, vegetated wetland/salt marsh and their associated 100-foot buffer zones, land under salt ponds, land subject to coastal storm flowage (LSCSF) (100-year floodplain/velocity zones) as well as the Weir River ACEC. Impacts to vegetated wetland/salt marsh, coastal beach/bank, LSCSF and the ACEC will be minimized to the greatest extent practicable. Approximately 881 square feet (s.f.) of impacts to salt marsh/BVW, 961 s.f. will be replicated/restored along Straits Pond. Associated stormwater drainage upgrades will also improve overall quality of stormwater discharges to Straits Pond through TSS removal and the addition of pre-treatment devices. Ten of these existing outlets occur within wetland resource areas, three (3) of which are located within salt marsh at/below

MHW and seven (7) of which are located with bordering vegetated wetland (BVW) above MHW.

Special resources in the vicinity of the project area include the Weir River ACEC (See Figure 5) associated with Straits Pond that is designated as an Outstanding Resource Water (ORW). Barrier beach, as identified on the MassGIS website (See Figure 6) is located at the central and eastern portions of the project site. This area also lies within Federal Emergency Management Association (FEMA) areas subject to high-velocity waters (Zone VE) and areas with a known flood elevation (Zone AE) which are subject to 100-year storm events (See Figure 4.) No Natural Heritage Endangered Species Program (NHESP) estimated or Priority Habitat of rare-listed species (See Figure 3) or NHESP BioMap Core Habitat as identified on MassGIS data layers (See Section 2.3.2.1 below) occur along the proposed project route. However, the NHESP and US Fish and Wildlife Service (USFWS) lists the northern long-eared bat (*Myotis septentrionalis*) as threatened statewide for the Commonwealth of Massachusetts and Time of Year (TOY) clearing restrictions have been prescribed for tree clearing to protect this species. No surface drinking water (Zone A or B) or DEP Wellhead Protection Areas (Zone II or IWPA) are associated with Straits Pond or the Atlantic Avenue project route, and no cultural, historical or archeological resources were identified for the project area with the Massachusetts Historic Commission (MHC) (See Appendix C).

Environmental permitting (See Appendix A) associated with the project involved filing Notice of Intent with the Town of Hull Conservation Commission, as identified previously, with an Order of conditions issued on 12/14/20 for work within wetland resource areas and their buffer zones. An Environmental Notification Form (ENF) under the Executive Office of Energy and the Environment (EOEEA) Massachusetts Environmental Policy Act (MEPA) was filed on 01/29/21 and is currently under review. Additional filings for this month included a Chapter 91 License application with the DEP Waterways Program for work within filled and flowed tidelands filed on 02/03/21 as well as a Pre-Construction Notification (PCN) application under the US Army Corps of Engineers (Corps) General Permit (PGP) program filed on 02/08/21. These permits are being filed in coordination with this §401 Water Quality Certificate (WQC) application. Once the permits/authorizations are received, they will be forwarded to the DEP as part of the filing process.

## 2.2 EXISTING CONDITIONS

Coastal waters north of Atlantic Avenue along Nantasket Beach, Gun Rock Beach, Crescent Beach and Black Rock Beach (listed west to east) are part of the Massachusetts Bay/Atlantic Ocean (See Figures 1 & 2– Locus Map). The brackish estuary/tidal pond south of Atlantic Avenue is identified as Straits Pond on the USGS Nantasket Beach Topographic Quadrangle Map. It connects to Hull Bay (west) and Massachusetts Bay via a tidal flood gate at the southwest end of the pond beneath Nantasket Avenue/Route 228. Land use along Atlantic Avenue is densely residential, with the Town of Hull Municipal buildings (Town Hall, police and fire departments) located at the western end of the project along School Street near Nantasket Avenue/Route 228. Sporadic commercial businesses occur along Atlantic Avenue as well. Open space along the project corridor consists of coastal/barrier beaches, coastal

banks/seawalls and intertidal rocky shores to the north, sporadic stands of landscaped trees/shrubs located on both sides of the Atlantic Avenue associated with the residential properties, and Straits Pond to the south. The Green Hill Playground and tennis/basketball court is located near the center of the project west of the junction of Stony Beach Road near Gun Rock Beach.

Topography along Atlantic Avenue in the project area is variable with elevations ranging from approximately 4 –54 feet above sea level. The highest elevations (54 +/- feet) are associated with the municipal buildings and residential communities that occur on Atlantic Hill, a drumlin at the western end of the project. Green Hill, a drumlin accessed by Summit Avenue at the eastern end of Atlantic Avenue between Black Rock and Crescent Beaches, is over 45 feet in height. The lowest elevations exist in the middle of the project route opposite/south of Crescent Beach. These areas are designated as barrier beaches (See Figure 6) with FEMA 100-year velocity and flood zones, although due to the seawalls, houses and road infrastructure, they provide little natural function any longer (See Section 2.3.1.4 below). Hull is comprised primarily of glacial outwash materials characterized as well-sorted gravels and sand, as well as cobbles and occasional small boulders. Soils are variable along Atlantic Avenue with the dominant soil types classified as Canton-Urban land -Rock outcrop, Urban land-Hooksan complex, Paxton loam and the Canton-Chatfield-Rock outcrop (See Appendix G – NRCS Soil Information). Black Rock and Crescent Beaches are comprised of sand, gravel, cobble and rock substrate while Gun Rock Beach is predominantly coarse and fine sands.

Uplands along the project corridor are a mix of un-vegetated and vegetated areas. Un-vegetated areas consist of open beach, seawalls, paved roads and sidewalks. Manicured lawns and landscaped trees and shrubs associated with the single-family residences as well as undeveloped road edges represent the vegetated areas along Atlantic Avenue, although saltmarsh is present along some stretches of Straits Pond south of the road. A concrete/stone sea wall of variable height (approximately 3-10+ feet) parallels Atlantic Avenue along Gun Rock Beach, Crescent Beach, and Black Rock Beach and protects the road from the majority of erosive tidal storm surges. Rock outcrops/rocky intertidal shore occur intermittently along Green Hill and Atlantic Hill between the beaches bordering Massachusetts Bay north of the road.

The paved travel way of Atlantic Avenue varies in width from 24 to 32 feet. There are minimally defined, paved and unpaved shoulders. Presently, the pavement surface on Atlantic Avenue from Nantasket Avenue/Route 228 to the Town Hall is in fair condition. This section had a pavement overlay in the late 1990's. The remainder of Atlantic Avenue is in poor condition with numerous potholes and utility trench patches, although sections of roadway have been recently resurfaced during the past few years due to utility work and poor pavement. Prior to resurfacing, there was a significant amount of map cracking and some pavement spalling along Atlantic Avenue. The severity of the pavement failures, significant amount of patching, and areas of deformation indicate that the subbase is in poor condition as well.

Bituminous concrete sidewalks are in very poor condition along the south side of Atlantic Avenue for the project's entire length. Isolated sections of sidewalk are located along portions of the northern side of Atlantic Avenue passing mainly through a thickly settled residential area. A few side streets have sidewalks, but with virtually no connecting walkways, and pedestrian

access between streets is restricted. Parallel parking by permit only exists along portions of the south side of Atlantic Avenue. The Hull Town Hall, Marylou's Coffee, Green Hill Playground, and multiple beach access points are located along the project corridor serving as pedestrian generators.

Stormwater runoff along the roadway is collected by multiple closed drainage systems consisting of catch basins and manholes, although direct discharge of surface runoff to Straits Pond occurs via pipes from the roadway gutter and a paved waterway. The stormwater is conveyed to various outlet points along the corridor, many of which discharge directly to Straits Pond. The existing drainage structures appear to be in poor condition and most are proposed to be replaced.

## **2.3 Environmental Resources and Proposed Impacts/Mitigation**

Wetland resource areas were delineated in October 2009 and reviewed in the Spring 2020 by a CHA Professional Wetland Scientist (PWS) in accordance with the Department of Environmental Protection (DEP) publication "Delineating Bordering Vegetated Wetlands" under the Massachusetts Wetlands Protection Act (1995) and the U. S. Army Corps of Engineers Wetland Delineation Manual (*Environmental Laboratory 1987*). Coastal resources under the jurisdiction of the §401 WQC Program identified in the project vicinity during field investigations and through research include: coastal beaches/tidal flats (310 CMR 10.27); coastal bank (310 CMR 10.30); salt marshes (310 CMR 10.32); bordering vegetated wetlands (BVW) (310 CMR 10.55); land subject to coastal storm flowage (LSCSF)/FEMA Floodplains (310 CMR 10.04 and 10.21); land under salt ponds (310 CMR 10.33); and, 100-foot buffer zones (310 CMR 10.02) associated with coastal beaches, coastal bank and salt marsh/BVW. Each resource area is described in detail in the sections below. Coastal resources under the jurisdiction of the §401 WQC program include salt marsh/BVW, land under salt ponds and intertidal zone as well as an ORW in an ACEC (designated at MHW). Each of the resource areas (See Appendix E, DEP Data Forms and Appendix D, Site Photos) and proposed impacts/restoration are described below.

### **2.3.1 Coastal and Inland Resources**

#### **2.3.1.1 Coastal Beach/Tidal Flats & Barrier Beach**

Areas of coastal beach defined under 310 CMR 10.27 (2) of the WPA Regulations "*extend from the MLW landward to the dune line, coastal bank line or the seaward edge of existing man-made structure*". Tidal flats are defined as "*any nearly level part of a coastal beach which usually extends from the mean low water line (MLW) landward to a more steeply sloping face of coastal beach*" under 310 CMR 10.27 (2). Black Rock and Crescent Beaches are comprised of sand, gravel, cobbles and rock substrate while Gun Rock Beach is predominantly coarse and fine sands. There is a 100-foot buffer associated with coastal beach. No work is proposed on coastal beach with this project.

Barrier beach (See Figure 6) is defined under 310 CMR 10.29 (2) as "*a narrow low-lying strip of land generally consisting of coastal beaches and coastal dunes extending roughly parallel to the trend of the coast. It is separated from the mainland by a narrow body of fresh, brackish or*



*saline water or a marsh system. A barrier beach may be joined to the mainland at one or both ends.*” Barrier beaches are designated from Gun Rock Beach and Crescent Beach south to Straits Pond and encompass the landforms between the beaches and the estuary/tidal pond. Another section of barrier beach occurs east of Summit Avenue in Hull and extends east to Jerusalem Road in Cohasset. Due to the existing coastal seawalls, residential development and road infrastructure, natural function in these areas is limited.

Proposed road reconstruction will involve work/disturbance within barrier beaches (114,975 s.f. temporary impacts and 1,777 s.f. permanent). However, these areas are predominately existing, disturbed road edges immediately adjacent to Atlantic Avenue associated with densely residential communities. Road reconstruction and related work is not anticipated to significantly impact the current function of barrier beaches along the project corridor and will improve road drainage to Straits Pond and public safety.

#### 2.3.1.2 Coastal Bank

Areas of Coastal Bank as defined under 310 CMR 10.30 (2) of the WPA Regulations include *“the seaward face or side of any elevated landform, other than a coastal dune, which lies at the landward edge of coastal beach, land subject to tidal action, or other wetland”*. Coastal bank is calculated according to the *Wetlands Program Policy 92-1: Coastal Banks* using slope gradients and Land Subject to Coastal Storm Flowage (LSCSF)/FEMA 100-year velocity/flood elevation lines. It occurs at the approximate landward edge of the coastal beach, vegetated wetland/salt marsh and/or along seawalls/riprap slopes along Atlantic Avenue. Due to historic road/infrastructure and residential development along the project corridor, coastal banks at the landward edge of coastal beaches north of Atlantic Avenue along Gun Rock, Crescent and Black Rock Beaches (See Figures 1 & 2) occur predominantly at the top of the concrete/rock seawalls. Natural coastal bank/intertidal rocky shores occur along the drumlins, Green Hill (eastern portion of project) and Atlantic Hill (western portion of project), and intermittently between Nantasket, Gun Rock, Crescent and Black Rock Beaches. On the south side of Atlantic Avenue, topography is relatively flat in most locations and coastal bank occurs at the approximate mean high water (MHW) line at the landward edge of vegetated wetland/salt marsh, along lawns/small private retaining walls associated with residential properties and/or at the top of riprap slopes. An extensive riprap embankment, over 1,000 feet in length, separates Straits Pond from Atlantic Avenue between Driftway “Road” and Summit Avenue, opposite Green Hill. Coastal Bank occurs at the top of the riprap slope in this location south of Atlantic Avenue/sidewalk and extends east along the top of slope to the Hull/Cohasset Town Line. In addition, opposite the Green Hill Playground and tennis/basketball court near Gun Rock Beach, coastal bank occurs at the top of slope south of Atlantic Avenue/sidewalk in this area as well. There is a 100-foot buffer associated with coastal bank.

South of Atlantic Avenue, replacement and minor extension of existing stormwater culverts/outlets along Straits Pond, widening/restoring riprap slope and wetland replication/restoration will result in 145 s.f. of disturbance. Ten of these existing outlets occur within wetland resource areas, three (3) of which are located within salt marsh at/below MHW and seven (7) of which are located with bordering vegetated wetland (BVW) above MHW.

This impact is minor and associated with stormwater system upgrades and will improve overall water quality discharged to Straits Pond without compromising coastal bank function in these areas.

#### 2.3.1.3 Salt Marshes/Bordering Vegetated Wetland (Inland)

Vegetated wetland/salt marsh are jurisdictional under the §401 WQC Program and the WPA. They are defined under 310 CMR 10.32 (2) of the WPA regulations as “*coastal wetlands that extend landward up to the highest high tide line, that is, the highest spring tide of the year, and are characterized by plants that are well adapted to or prefer living in, saline soils. A salt marsh may contain tidal creeks, ditches and pools*”. Bordering vegetated wetlands (BVW) are defined under 310 CMR 10.55 (2) of the WPA regulations as “*freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants*”. The DEP identified common reed as a saltmarsh species under the WPA (October 2014) in addition to the various saltmarsh grasses (*Spartina* spp.) and other coastal species. Wetland Series A, B, C and D (See Appendix D & E) define coastal vegetated wetlands along Straits Pond that are classified as estuarine, emergent communities and dominated by salt marsh (*Spartina* spp.) and common reed (*Phragmites australis*). The wetland boundaries were delineated at/adjacent to the approximate MHW line in many locations with pink, survey, nylon flags. Saltmarsh cordgrass (*Spartina alterniflora*) and common reed are the dominant species within the intertidal zone below the MHW line. Marsh elder (*Iva frutescens*), common reed, saltgrass (*Distichlis spicata*), saltmeadow cordgrass (*Spartina patens*) and seaside goldenrod (*Solidago sempervirens*) occupy the adjacent areas at/above MHW at the wetland/upland transition zone. In drier wetland areas above MHW, such as along Wetland D near the edge of Atlantic Avenue opposite the Green Hill Playground, the vegetative communities are dominated by a monoculture of common reed. With the return of tidal cycles within Straits Pond as a result of the construction of the new tide gate, vegetated wetland/salt marsh is recolonizing some areas, but common reed is still prevalent at the upper reaches of the intertidal zone and above in many areas. Adjacent to Wetland A at the eastern end of the project near the Hull/Cohasset Town line, a stand of American beachgrass (*Ammophila breviflora*) was planted on a gradual slope as a conservation project between Atlantic Avenue and the wetland edge at Straits Pond. The community represents a dune resource area and was included within the delineation line of Wetland A.

Soils within the saltmarsh communities are characterized by a deep organic surface layer (O<sub>A</sub>). However, in areas along the road and over-wash zones as a result of storm surges and flooding from Massachusetts Bay, coarse and fine sand deposition 2 - 3+ inches deep was observed at the surface. Trash, in the form of bottles, bags and other household garbage due to the adjacent residential communities and road traffic from Atlantic Avenue was prevalent in some areas observed during the field evaluation. There is a 100-foot buffer associated with vegetated wetland/salt marsh.

Approximately 264 square feet (s.f.) of salt marsh and 617 s.f. of BVW are proposed to be impacted as discussed below associated with wetland replication/restoration, slope work and

stormwater management/erosion protection (See Appendix G, Wetland Replication & Restoration Plan and Section 5, Project Plans). Approximately 327 s.f. of salt marsh replication/restoration (227 s.f. low marsh ( $\leq 2.8$  feet (MHW – NAVD 88)) and 100 s.f. high marsh ( $> 2.8$  feet and  $< 3.2$  feet)) are proposed. Another 319 s.f. of BVW are also proposed to be replicated. Due to its position on the landscape and elevation requirements at/below MHW, the low marsh replication area is proposed to be sited on existing high marsh (218 s.f.) and BVW (109 s.f.) wetland areas, and access is also required through these wetland habitats. Following grading and revegetation of the low marsh, the high marsh (100 s.f.) and BVW (315 s.f.) temporarily altered will be restored and/or replicated. It should be noted that of the total 617 s.f. of BVW proposed to be impacted for the project, approximately 109 s.f. is located within the newly proposed, replicated salt marsh (below 3.2 feet elevation), and additional BVW replication area, approximately 319 s.f., has been incorporated into the project design accordingly. The replicated BVW is proposed on upland areas adjacent to existing salt marsh/BVW within the WPA 100-foot buffer zone. Restoration of 2,080 s.f. of the WPA 100-foot buffer zone associated with improvements to the stormwater control outlet and parking area reconfiguration is proposed adjacent to the salt marsh and BVW replication areas in this vicinity.

#### 2.3.1.4 FEMA Flood Zones /Land Subject to Tidal and Coastal Storm Flowage

Land Subject to Tidal and Coastal Storm Flowage (LSCSF) is defined as “*land subject to any inundation caused by coastal storms up to and including that caused by the 100-year storm, surge of record or storm of record, whichever is greater*” (310 CMR 10.04 & 10.21). Federal Insurance Rate Maps (FIRM) from the Federal Emergency Management Agency (FEMA) (See Figure 4) for the Town of Hull (Panel #25023C 0039J - July 17, 2012) indicate 100-year flood and velocity zones (Zone AE & VE) are associated with Atlantic Avenue and adjacent infrastructure within the proposed project area. The Zone AE areas are designated between 10 and 17 feet above sea level, while the Zone VE areas along Massachusetts Bay are designated between 19 and 25 feet.

Proposed improvements and related work, approximately 225,800 s.f./5.2 acres (223,700 s.f. temporary and 2,100 s.f. permanent) associated with road reconstruction will occur within FEMA flood storage and velocity zones but are not anticipated to result in significant adverse impacts to the current functions of these areas.

#### 2.3.1.5 Land Under Salt Ponds/Intertidal Zone

WPA regulations 310 CMR 10.33(2) define a salt pond as “*a shallow enclosed or semi-enclosed body of saline water that may be partially or totally restricted by barrier beach formation. Salt ponds may receive freshwater from small streams emptying into their upper reaches and/or springs in the salt pond itself.*” Land under water or ocean or intertidal zone are jurisdictional under the §401 WQC Program. The substrate of Straits Pond is a mixture of fines, sand and gravel, although fines, forming a thick mud, dominate many areas. Straits Pond does not receive inputs from freshwater systems and is not designated as an *Anadromous/Catadromous* (“fish run”) (See Figure 5) nor a “land containing shellfish” (See Figure 7). However, Straits Pond is anticipated to provide habitat for larval and juvenile marine fish species, various crustaceans and shellfish as well as diverse bird species and is designated as part of the Weir River ACEC as

identified in Section 2.3.2.3. There is a 100-foot buffer associated with land under salt ponds measured from the mean high water line (MHW).

Replacement and minor extension of existing stormwater culverts/outlets and extension of modified rock-fill slopes will result in 85 s.f. of temporary disturbance to land under salt ponds adjacent to Wetland C. This impact is minor and associated with stormwater system upgrades and will improve the overall quality of stormwater discharges to Straits Pond.

#### 2.3.1.6 High/Low Water Lines for Straits Pond and Massachusetts Bay/Hull Bay

Straits Pond, identified on the USGS Nantasket Beach Topographic Quadrangle Map, is characterized as a brackish estuary/tidal pond and constitutes a Water of the United States within the Commonwealth of Massachusetts. It connects to Hull Bay (west) and Massachusetts Bay (north) via a tide gate at the southwest end of the pond beneath Nantasket Avenue/Route 228. The tide gate, operated by the Hull Conservation Commission, controls the tidal range within the pond (See Appendix H, MHW/MLW Supporting Documentation). The controlled mean high water (MHW) line for Straits Pond was established from surveyed salt marsh zones at Wetland C and review of tide gate records at approximately 2.8 feet above mean sea level (NAVD 88) and the controlled mean low water (MLW) line was determined at 1.6 feet. Water levels may fluctuate to as low as 1.0 foot during pond drawdown conditions and may rise above 3.8 feet during significant precipitation events or tidal surges over the seawalls during coastal storm events. In accordance with a DEP Formal Determination of Applicability (W00-025) in April, 2001 (See Appendix H) for a property on Bay Street bordering Hull Bay, MHW was established at approximately 5.0 feet (NVGD 29) with MLW presumably at approximately 0.0 feet. MHW for Massachusetts Bay along Gunrock, Crescent and Black Rock Beaches is also designated at 5.0 feet.

#### 2.3.1.7 WPA 100-foot Buffer Zone to Coastal Beach, Coastal Bank and Salt Marshes

Proposed Atlantic Avenue reconstruction and related work, including roadway widening/intersection safety modifications and enhancement, sidewalk replacement and storm drainage improvements, will take place within the WPA 100-foot buffer zone to coastal beach/tidal flats, coastal bank and/or vegetated wetland/salt marsh. Approximately 3.4 acres (149,500 s.f.) of alteration is proposed, although the majority of this area is existing paved road (2.9 acres/126,100 s.f.) and disturbed, maintained road shoulders, with a proposed minor decrease in impervious area of approximately 1,600 s.f. (proposed - 2.9 acres/124,500 s.f.) associated with intersection improvements and narrowing/redefining curb cuts. For the entire project, there will be a minor increase in impervious area (approximately 1,307 s.f.), but this occurs in uplands outside of WPA jurisdiction. Erosion controls will be placed at the limits of work, as seen on project plans (See Section 5,), to prevent sedimentation from entering wetland resource areas, and all pervious areas will be stabilized with vegetation and/or appropriate roadside treatments such as retaining walls, gravel, etc. following construction.

## 2.3.2 Other Federal, State and Local Resources

### 2.3.2.1 Weir River Area of Critical Environmental Concern/Outstanding Resource Waters

The proposed project corridor borders the Weir River Area of Critical Environmental Concern (ACEC) along Straits Pond. Constituting some of the most extensive salt marsh in the Greater Boston Area, the Weir River ACEC encompasses approximately 950 acres of land and water and is considered significant to flood control and the protection land containing shellfish, fisheries and wildlife habitat. The legal boundary corresponds with the 100-year floodplain in many areas, although it overlaps the MHW line and/or follows other artificial boundaries in some locations, particularly along Straits Pond (See Figure 5). According to the *Designation of Portions of the Towns of Cohasset, Hingham and Hull as the Weir River ACEC* (designated 12/11/86), the boundary of the ACEC in the area in question is as follows: *The line extends easterly to a point on Atlantic Avenue in Hull where Straits Pond is directly adjacent, this point defined as the northerly corner of Subdivision Lot 8, Sheet 51, Town of Hull Assessor's Map dated June 2, 1944, 1"=100', where the boundary again reverts to MHW. The line extends around Straits Pond at this elevation until it reaches a point, on the Cohasset/Hull Town line in the area known as West Corner, where Nantasket Avenue crosses the river, at or adjacent to the intersection of Nantasket Avenue and Rockland Street. At this point, the boundary reverts to the 100 year flood elevation and proceeds southerly and westerly along and under Rockland Street to the dam and a fish ladder at Foundry Pond*". Therefore, the MHW line (elevation 2.8 feet NAVD 88) of Straits Pond (See Section 2.3.1.6 above) marks the ACEC boundary. The ACEC is also designated as an outstanding resource water (ORW) and is under the jurisdiction of the §401 WQC Program.

Minimal work is proposed within the Weir River ACEC (below MHW line) associated with Straits Pond, and the project will not have a significant adverse impact to the interests of the ACEC designation or the WPA. Road widening, sidewalk replacement and stormwater improvements will only result in 881 s.f. of impact to salt marsh/BVW (dominated by with common reed) and this area will be replicated/restored with 961 s.f. new salt marsh/BVW, resulting in net gain. BMPs associated with this project (See Section 2.5.1), will be installed at the limits of work within/adjacent to the buffers to coastal beach, coastal bank and vegetated wetland/salt marsh prior to the commencement of construction. These controls will be inspected and maintained throughout construction and will remain in place until areas are permanently stabilized and avoid discharges of silt laden water and sediments from entering the Straits Pond/Weir River ACEC to avoid adversely impacting its function as an outstanding resource water.

### 2.3.2.2 Federal and State Threatened and Endangered Species

The USFWS New England Field Office listed the northern long-eared bat (*Myotis septentrionalis*) as a threatened species in Massachusetts on April 2, 2015 due to significant losses in population numbers as a result of White-nose Syndrome. It is also listed by the Massachusetts Division of Fisheries & Wildlife (DF&W) as endangered under the Massachusetts Endangered Species Act (MESA). The species range is identified as statewide in Massachusetts

and northern long-eared bats (NLEB) inhabit forested areas during the spring, summer and fall and hibernate in mines, caves and even structures such as barns during the winter months.

The USFWS currently relies on the habitat/species data for NLEBs collected by the Massachusetts Natural Heritage and Endangered Species Program (NHESP), although presence/absence data is limited for New England. On January 14, 2016, the USFWS issued a final 4(d) rule that developed time-of-year (TOY) tree-clearing restrictions to avoid adverse impacts to bats that may be roosting in trees that could be cleared. These include restrictions on: *1) removing a northern long-eared bat known occupied maternity roost tree or any trees within 150 feet of a known occupied maternity roost tree from June 1 through July 31; or 2) removing any trees within 0.25 miles of a northern long-eared bat hibernaculum at any time of year.* There are no minimum acreage tree-clearing thresholds established with the TOY restrictions and the USFWS may require review of tree-clearing areas to ensure no adverse impacts to northern long-eared bats for all projects. However, correspond with the USFWS indicated that “no federally-listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the USFWS are known to occur in the area” (See Appendix C).

A review of the NHESP Massachusetts Natural Heritage Atlas (August 2017 edition) and Massachusetts GIS data layers (2020) indicate that no estimated habitats of rare wildlife, certified or potential vernal pools or State BioMap Core or Critical Habitats, including known roost or maternity nest trees, occur on or immediately adjacent to the project site (See Figure 3 – NHESP Habitat Map). In addition, according to NHESP Fact Sheets, no northern long-eared bat hibernacula occur within the Town of Hull. The proposed work associated with the project within the WPA jurisdiction adjacent to the Straits Pond occurs predominately within/adjacent to paved roadways of Atlantic Avenue. Although clearing of road-side, landscaped trees is proposed for the project, any cutting/removal will occur within prescribed work windows and no “incidental takes” or significant adverse impacts to the bats or their habitat are anticipated.

#### 2.3.2.3 Water Quality/Impaired Water Resources/Contaminants

The Weir River is classified under the DEP *Massachusetts Year 2016 Integrated List of Waters* as a Massachusetts Category 5 impaired surface water (MA74-11) that requires the DEP to develop a Total Maximum Daily Load (TMDL) for “fecal coliform” and “PCB in fish tissue”. Category 5 water bodies are defined as “*water bodies not expected to meet surface water quality standards after implementation of technology-based controls*”. A TMDL for the Weir River has not yet been established for the identified impairments. Straits Pond is not classified as an impaired waterbody by the DEP, but due to tidal interchange with the Weir River estuary at the tide gate under Nantasket Avenue/Route 228, it may have elevated levels of fecal coliform. However, road reconstruction and related improvements associated with Atlantic Avenue are not anticipated to increase levels of the identified impairments, and the renovations to the existing stormwater system are anticipated to improve the water quality of stormwater discharges into Straits Pond. In addition, minimal impacts are proposed to vegetated wetland/salt marsh communities that may help to naturally filter fecal coliform.

#### 2.3.2.4 Public Shade Trees

An estimated 4 public shade trees, identified as those individuals of 14-inch diameter at breast height or greater within public road right-of-ways, will be removed as a result of roadway/sidewalk reconstruction and widening. Clearing of public shade trees has been avoided to the greatest extent practicable, and only a total of 11 trees will be cleared (including shade trees). However, due to road widening and increased area of pavement, no new trees are proposed to be replaced.

## 2.4 Proposed Road Reconstruction and Related work

### 2.4.1 Proposed Cross Section

The proposed cross section for the majority of Atlantic Avenue is a 30-foot-wide roadway with a 5.5-foot sidewalk running along the south side of the road for the full length. The 30-foot roadway consists of two 11-foot lanes and two 4 foot shoulders. The 4foot shoulder widths are in accordance with the required 4 – 12-foot width stated in Section 5.3.3.1 of MassDOT’s Project Development and Design Guide (PDDG). The 11-foot wide travel lanes also meet the required width of 11 to 12 feet stated in Section 5.3.3.3 of the Design Guide. Therefore, no design exception is required.

A 33-foot-wide cross section is proposed in areas where restricted parking is currently allowed along the corridor. This roadway consists of two 11-foot lanes and a 7-foot shoulder on the south side and a 4-foot shoulder along the north side of Atlantic Ave.

### 2.4.2 Roadway Reconstruction

Based on the results of the pavement cores, the poor pavement conditions, and the constraints along the corridor, especially the structures located in close proximity to the roadway, Atlantic Avenue will require full depth pavement reconstruction. The narrow width of the roadway and close proximity of buildings makes pavement reclamation a challenging task, so it is proposed that the existing pavement structure be removed in its entirety and replaced with a new pavement structure. Since it is apparent the subbase is inadequate, it will be removed and replaced as well.

### 2.4.3 Drainage Improvements

Proposed drainage improvements include the installation of new drainage structures, grates, inlets and pipes as well as adjusting, and rebuilding existing structures. Catch basin grates will also be “waffle” type, traversable by bicycles, consistent with the intended multi-use of the roadway shoulder.

### 2.4.4 Bicycle & Pedestrian Accommodations

The proposed improvements include reconstructing the existing sidewalks along Atlantic Avenue and providing wheelchair ramps, compliant with current ADA and MassDOT standards at

intersections and driveways. Widening of the roadway to a minimum of 30 feet will improve bicycle accommodations by providing adequate room for vehicles and bicycles to safely share the roadway. However, an additional 5 feet is not available for bicycle accommodation adjacent to the proposed widened shoulder for residential permit parking without major impacts to private properties and resource areas. Shared pavement markings “sharrows” will be added in highly trafficked areas including Mary Lou’s Coffee, the Green Hill Playground/basketball court and Gun Rock Beach access. “Share the Road” signs will be added throughout the project corridor for improved bicycle and pedestrian awareness.

#### **2.4.5 Pedestrian Facilities**

New asphalt sidewalks with granite curbs are proposed as part of this project. A continuous sidewalk along the south side of Atlantic Avenue is proposed. New wheelchair ramps, compliant with current ADA and MassDOT standards will be constructed at intersections and driveways, where required. New crosswalks and signage are proposed to improve pedestrian safety.

#### **2.4.6 Safety Improvements**

Existing traffic signs that are in poor condition, or that are not warranted, will be removed. New signs, conforming to the provisions of the Manual on Uniform Traffic Control Devices (MUTCD) and the MassDOT, will be installed. These signs will be consistent with the proposed roadway design.

Thermoplastic pavement markings are proposed to delineate the traveled ways and shoulders. Stop lines and crosswalks will be added at intersections. The yellow centerline will be painted to appropriately designate no passing zones throughout the project length.

The intersection of School Street and Atlantic Avenue is currently configured with a landscaped island and a designated left turn lane onto Atlantic. The crossing distance for the intersection is 155’. Existing and projected traffic volumes were analyzed and it was determined that the left turn lane is not needed for this intersection. School Street has been designed to reduce the pavement width to better facilitate pedestrian crossing.

Minor geometric changes are proposed to the Summit Avenue and Stony Beach Road intersections with Atlantic Avenue. Currently these roadways intersect at poor angles with Atlantic Avenue, restricting sight distance and creating a safety hazard with no discernable edge of pavement along Atlantic Avenue. The proposed alignments will provide more of a “T” configuration, intersecting Atlantic Avenue at about a 90-degree angle. This will make the intersections smaller, provide some separation between adjacent side streets, provide better channelization, and provide definitive stop conditions.

### **2.5 General Construction Sequence**

The following section provides construction details and highlights the construction sequence and timing of earthmoving activities.



### **2.5.1 Erosion and Sediment Control Measures**

Erosion and sedimentation control measures consisting of compost filter tubes and silt fence have been incorporated into the project design to control runoff and prevent impact to wetland resource areas throughout construction. Designs and locations of the erosion and sedimentation controls are shown on site plans and details (See Section 5).

Erosion and sedimentation control (ESC) measures will be installed at the limits of work within/adjacent to the buffers to coastal beach, coastal bank and vegetated wetland/salt marsh prior to the commencement of construction. Earth moving activities will be conducted only after ESC measures are installed and inspected. Installation and maintenance of ESC measures will reduce soil erosion on the project site and prevent sedimentation from occurring both on and off the project alignment. These controls will be inspected and maintained throughout construction and will remain in place until areas are permanently stabilized. Reserve compost filter tubes will be stored in a construction yard/approved work area and installed as needed to control any erosion problems.

During road reconstruction, if trench dewatering is necessary, dewatering structures consisting of compost filter tubes (approximately 10 x 10 feet) will be constructed (See Section 5, Site Plans). Dewatering structures are important to ensure adequate filtration of ground water seepage pumped from the excavated trench/tie-in areas during construction to avoid impacts to water quality. All dewatering areas will be constructed outside of the 100-foot buffer zone to BVW whenever possible.

### **2.5.2 Existing Utility Location**

All existing active sewer, water, gas, electric and other utilities will be identified prior to project construction. During construction, if other undocumented utility lines are encountered, they shall be marked, recorded, and protected at all times. The contractor shall record all existing utilities on the construction documents.

### **2.5.3 Vegetation Clearing**

Minimal clearing is anticipated with this proposed project since the majority of the project consists of road reconstruction within paved road rights-of-way and adjacent road shoulders. However, where selective clearing and thinning are proposed to maintain clear zones and intersection sight distances, right-of-way boundaries and workspace limits will be clearly delineated prior to the commencement of clearing to ensure that no clearing occurs beyond these boundaries.

Clearing operations will include the removal of trees, shrubby vegetation and other organic materials within the construction workspace. Clearing methods employed will be dependent on vegetation density and topography. Prior to the commencement of clearing activities, the limits of clearing will be identified in accordance with the construction drawings. All construction

activities and ground disturbance will be confined to the workspace as depicted on the construction drawings. Vegetated areas within the proposed project limits will be cleared by mechanical cutting, hand-cutting or a combination of both. Vegetation, debris, and rocks/boulders removed from work spaces will be transported to an appropriate facility or will be disposed of properly. No large boulders will be permitted to be buried on the site, and all cleared vegetation will be removed from the project site.

#### **2.5.4 Minor Grading and Excavation**

During this phase of construction, minor grading will take place to prepare for excavation and road widening. If suitable topsoil is found, it will be removed and stockpiled in an upland area. The stockpiled topsoil will be protected with silt fencing and/or temporarily seeded until ready for use on an as needed basis. Old pavement (bituminous concrete and curbing) may be excavated from the construction areas during this phase of construction. Pavement may be excavated to the top of the gravel foundation and discarded in an environmentally appropriate location as designated by the MassDOT and approved by local and state regulatory agencies, or be reused as sub-base materials for new pavement areas.

#### **2.5.5 Road Construction**

During this phase, preparation of the sub-grade of the roadway will be completed and the various layers of the road base will be installed. This generally includes a layer of gravel borrow overlain by a second layer of dense graded crushed stone. A base course of hot mix asphalt underlies the actual road surface that is generally composed of asphalt pavement. Thickness and consistencies of layers vary depending on use. Thermoplastic pavement markings will be applied as the final step in roadway construction.

#### **2.5.6 Site Stabilization**

The final phase of the project is the restoration and stabilization of all exposed surfaces. Mulch is intended to stabilize the soil surface and shall consist of hay, straw, erosion control fabric and/or some functional equivalent approved by the Engineer or Environmental Inspector.

Side slope/road aprons will be loamed and seeded and other exposed areas will be loamed and seeded or landscaped where applicable. In the event that weather conditions prevent final restoration with vegetation, temporary erosion and sedimentation measures will be employed until the weather is suitable for final cleanup. A final inspection will ensure that the project site is cleared of all project debris and that vegetation is well established or erosion and sedimentation controls are functioning properly. Erosion controls will not be removed until the site is stabilized and the final inspection is complete.

### **2.5.7 Monitoring/Maintenance**

Monitoring and maintenance will occur during the construction phase of the project and until all final approvals have been obtained. Erosion and sediment control (ESC) measures will remain in place during the various phases of construction until the disturbed areas are fully stabilized. The Contractor shall conduct follow-up inspections of all disturbed areas after the first and second growing seasons to determine the success of re-vegetation. Revegetation shall be considered successful if the vegetative cover is sufficient to prevent the erosion of soils on the disturbed workspace, defined when vegetation has a uniform 75% vegetative coverage. If sufficient vegetative cover has not been achieved or if there are excessive noxious weeds after two full growing seasons, a professional agronomist shall be consulted to determine the need for additional restoration measures. It is anticipated due to the length of the project that some areas may be assessed as fully vegetated while certain portions of the project are still under construction. However, the project will not be considered complete until all areas of disturbance meet the 75% vegetative cover standard.

A final inspection will ensure that the project site is cleared of all project debris and that erosion and sedimentation controls are functioning properly. Compost filter tubes will not be removed until the final inspection is complete and a certificate of compliance is issued.

## **2.6 Regulatory Compliance & Alternative Analysis**

In accordance with the §401 WQC Program, the Department of Environmental Protection (DEP) recognizes jurisdiction of certain coastal resources that occur within the proposed Atlantic Avenue Reconstruction Project, including vegetated wetland/salt marsh (310 CMR 10.32), land under salt ponds/intertidal zone (310 CMR 10.33) at/below MHW as well as work within Straits Pond/Weir River ACEC designated as an Outstanding Resource Water (ORW). The Wetlands Protection Act (WPA) 310 CMR 10.00 identifies jurisdiction of a number of coastal resources within project corridor as well including: coastal beaches/tidal flats (310 CMR 10.27); coastal bank (310 CMR 10.30); vegetated wetland/salt marsh; land subject to coastal storm flowage (LSCSF)/FEMA floodplains (310 CMR 10.04 and 10.21; land under salt ponds; and, 100-foot buffer zones (310 CMR 10.02) associated with coastal beaches/tidal flats, coastal bank and vegetated wetland/salt marsh. Per requirements of the §401 WQC program and WPA, an alternative analysis and project regulatory compliance review are discussed in the following sections.

### **2.6.1 Alternative Analysis**

This project has undergone an alternative analysis per the requirements of the §401 WQC Program (314 CMR 9.06(1)), see Section 2.6.2 below, and the WPA under the limited project designation 10.24(7)(c)1. – *Maintenance and improvement of existing public roadways, but limited to widening less than a single lane, adding shoulders, correcting substandard intersections, and improving drainage systems*”. The alternative analysis demonstrates that there are no practicable and substantially equivalent alternatives with less adverse effects on the coastal resources/interests of the §401 WQC Program and/or the WPA to the proposed design.

However, Atlantic Avenue is an existing road bordered by residential communities/roads, commercial businesses and municipal buildings, and the scope of alternatives is limited due to this existing infrastructure. Described below are the alternatives that were considered for the project.

#### 2.6.1.1 No Action Alternative

The “no action” alternative would not improve the existing conditions along the project corridor. The existing roadway is relatively narrow in certain locations, and the area around the Hull Town Hall and Mary Lou’s Coffee has frequent use of on-street parking. However, the existing pavement section is too narrow to accommodate the vehicles and requires cars to pull onto the sidewalk or park in the active travel lanes. In addition, the geometry of the existing intersection east of the Town Hall, which is wide with unclear lane delineation and creates driver confusion, will not be improved.

Along most of Atlantic Avenue, the existing sidewalk is not well defined where the existing curb and sidewalk are HMA (hot mix asphalt), effectively blending the shoulder and road. Also, the existing curb ramps are non-existent or non-ADA (Americans with Disabilities Act) compliant. There is a lack of crosswalks across Atlantic Avenue from Nantasket Avenue to Straits Pond as well. Finally, the existing storm drainage system does not extend the entire length of Atlantic Avenue, and current outfalls discharge directly from the roadway surface to Straits Pond without any treatment of the stormwater runoff. The “no action” alternative will not extend the service life of Atlantic Avenue or improve pedestrian or environmental conditions along the existing road system.

#### 2.6.1.2 Simple Resurfacing Alternative

Simple resurfacing of the existing roadway was also considered. While this alternative would extend the surface life of the roadway, it will not achieve the project goals of improving roadway conditions, pedestrian and bicycle safety, improved storm water quality/control as well as pedestrian and vehicular safety at intersections along Atlantic Avenue.

#### 2.6.1.3 Rerouting Alternative

Atlantic Avenue is one of only three roadways that provides access to Hull and it serves as the only land-based connection to the mainland. Rerouting Atlantic Avenue further from Straits Pond, in areas where it is feasible, to avoid impacts to special resource interests such as salt marsh and/or the Weir River ACEC is not a practical alternative. Land acquisition would be difficult and costly due to existing residential properties and/or conservation lands along the road corridor. Moreover, the continuity of Atlantic Avenue precludes avoidance of linear features such as the designated barrier beach system (See Figure 6) and the FEMA 100-year Velocity and Flood Zones/LSCSF (See Figure 4) that occupy the central and eastern portions of the project route.

#### 2.6.1.4 Preferred Alternative

The preferred alternative will provide a consistent cross section consisting of two 11-foot lanes, two 4-foot shoulders and a 5.5-foot sidewalk. From Meade Avenue to Driftway, a 7-foot shoulder will be provided on the south side of Atlantic Avenue for resident permit parking. The proposed improvements will occur primarily within the existing road right-of-way although minor permanent easements are required to provide a minimum 5.5-foot wide sidewalk with the 7-foot shoulder. The proposed storm drainage system includes a closed system with deep sump sedimentation catch basins and/or manholes. No new storm drainage outlets are proposed, and existing outlet points will be retained with many of the outlets discharging into Straits Pond. Coastal vegetated wetland/salt marsh that is impacted by the proposed rockfill slope around Straits Pond and culvert improvements will be replicated at a ratio of 1.1:1.

### 2.6.2 Compliance with §401 WQC Criteria

The following section provides compliance with the performance standards set forth in 314 CMR 9.06 that are applicable to the project.

#### 2.6.2.1 Conformance with 314 CMR 9.06(1)

*314 CMR 9.06(1) – No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.*

As identified in Section 2.6.1 above, an alternative analysis was conducted in order to avoid and/or minimize adverse impacts to vegetated wetland/salt marsh, lands under salt ponds/intertidal zone at/below MHW as well as Straits Pond/Weir River ACEC designated as an ORW. The proposed road reconstruction involves minor widening of the existing roadway and adjacent existing sidewalk. Residential and commercial buildings occupy one or both sides of Atlantic Avenue essentially for its entire length. Minimal vegetated wetland/salt marsh will be impacted (881 s.f.) and this area will be replicated at a ratio of 1.1:1. (961 s.f.). Impacts to the Weir River ACEC are minimal, and associated stormwater drainage upgrades will improve overall quality of stormwater discharges to Straits Pond. Temporary and permanent disturbances associated with road reconstruction of Atlantic Avenue to the barrier beach system and FEMA flood zones will not significantly alter the current functions of these areas, and due to the existing residential development and road infrastructure in these areas, natural function is limited under current conditions.

#### 2.6.2.2 Conformance with 314 CMR 9.06(2)

*314 CMR 9.06(2) – No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will avoid and minimize potential adverse impacts to the bordering or isolated vegetated wetlands and land under water or ocean or intertidal zone. However, no such project may be permitted which will have any adverse effect on specified habitat sites of Rare Species.*

For projects located in ACECs (310 CMR 10.24(5)), the WPA requires that that any proposed project shall have “no adverse effect” on areas determined to be significant to the protection of jurisdictional interests. Straits Pond is not designated as an *Anadromous/Catadromous* (“fish run”) (See Figure 5) nor a “land containing shellfish” (See Figure 7). However, Straits Pond is anticipated to provide habitat for larval and juvenile marine fish species, various crustaceans and shellfish as well as diverse bird species and is designated as part of the Weir River ACEC. Minimal work is proposed within the Weir River ACEC (at/below MHW line) associated with Straits Pond, identified as an ORW. Proposed work includes areas where the existing stormwater drainage system is to be renovated along Straits Pond. The existing outfalls to be replaced and/or modified will occur within riprap slopes and/or salt marsh areas vegetated with monocultures of common reed, an invasive coastal and inland wetland species. The proposed filled area, 264 s.f., will be replicated with 327s.f. of native saltmarsh species (*Spartina* spp.) and improve the value and function of the wetland in this area and does not represent an adverse impact. No adverse impacts are anticipated as a result of outfall replacement and future stormwater runoff from Atlantic Avenue will not be directly discharged into Straits Pond.

The Atlantic Avenue project corridor within the existing road right-of-way does not represent significant wildlife habitat in terms of food, shelter or breeding/migration areas due to active road use and regular maintenance of the existing road right-of-way. No Natural Heritage Endangered Species Program (NHESP) estimated or Priority Habitat of rare-listed species (See Figure 3) or NHESP BioMap Core Habitat as identified on MassGIS data layers (See Section 2.3.2.1 below) occur along the proposed project route. Although northern long-eared bats are listed as a federally endangered species statewide in Massachusetts, no habitat is listed for the Town of Hull. Proposed clearing of road-side, landscaped trees for the project is minimal, 4 trees total, and no “incidental takes” or significant adverse impacts to the bats or their habitat are anticipated.

#### 2.6.2.3 Conformance with 314 CMR 9.06(3)

*Except as otherwise provided in 314 CMR 9.06(3), no discharge of dredged or fill material shall be permitted to Outstanding Resource Waters. The discharge of dredged or fill material to an Outstanding Resource Water in association with an activity listed in 314 CMR 9.06(3)(a) through (k) may be permitted without requiring the applicant to obtain a variance in accordance with 314 CMR 9.08 provided that the Department determines that the discharge of dredged or fill material may be permitted in accordance with 314 CMR 9.06(1), (2), (4), (5), and (7), and is not identified in 314 CMR 9.06(4) as a discharge of dredged or fill material that requires a variance.*

*(c) Maintenance, repair, replacement or reconstruction but not substantial enlargement of existing and lawfully located structures or facilities including buildings, roads, railways, utilities, dams, and coastal engineering structures;*

Proposed road reconstruction and related work along Atlantic Avenue do not represent a substantial enlargement of the existing road corridor and qualify under 314 CMR 9.06(3)(c). As identified in Sections 2.2 and 2.4 above, the paved travel way of Atlantic Avenue varies in width

from 24 to 32 feet. There are minimally defined, paved and unpaved shoulders and bituminous concrete sidewalks are in very poor condition along the south side for the project's entire length. The proposed cross section for the majority of Atlantic Avenue is a 30 foot wide roadway with a 5.5 foot sidewalk running along the south side of the road. A 33 foot wide cross section is proposed in areas where restricted parking is currently allowed along the road corridor. The roadway design has been developed to avoid and/or reduce impacts to wetland resource areas to the greatest extent practicable. Approximately 881 s.f. of impacts to vegetated wetland/salt marsh, 961 s.f. will be replicated within areas along Straits Pond.

#### 2.6.2.4 Conformance with 314 CMR 9.06(6)

*Except as otherwise provided in 314 CMR 9.06, stormwater discharges shall be provided with best management practices (BMPs) to attenuate pollutants and to provide a setback from the receiving water or wetlands in accordance with the following "Stormwater Management Standards" as further defined and specified in the "Massachusetts Stormwater Handbook", and as set forth in the regulations (9.06(6)(a) 1. – 10. as applicable).*

The stormwater management system improvements as described in Section 2.4 will meet the 2008 Massachusetts Stormwater Management Standards to the maximum extent practicable, as required for redevelopment projects, by utilizing multiple BMPs, both conventional and proprietary, as required under 314 CMR 9.06(6). The Engineering Management Report (See Appendix I) includes a discussion of conformance with the Stormwater Performance Standards.

1. *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

No new stormwater outlets are proposed with this project. As previously described in this document, and identified on the construction drawings (See Section 5), the proposed improvements to the stormwater drainage system, including deep sump sedimentation catch basins and/or manholes, will improve overall stormwater collection and discharge of treated water to Straits Pond along Atlantic Avenue. Ten of these existing outlets occur within wetland resource areas, three (3) of which are located within salt marsh at/below MHW and seven (7) of which are located with bordering vegetated wetland (BVW) above MHW.

2. *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*

In accordance with the 2008 Massachusetts Stormwater Management Standards, and as described previously, stormwater discharge levels (volume, intensity and duration) toward Straits Pond/Weir River will not change significantly between pre- and post-development.

3. *Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-construction site shall approximate the annual recharge from pre-development*

*conditions base on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Management Standards.*

Ground water recharge/infiltration will not change significantly between pre- and post-development as a result of the proposed project.

4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).*

Redevelop projects are required to meet TSS removal rates only to the extent practicable. All direct discharges of stormwater (associated with the project) to Straits Pond will be modified to include pre-treatment devices, i.e. deep sump sedimentation catch basins and/or manholes, for improved water quality.

5. *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such use as provided in the Massachusetts Stormwater Handbook...*

Land uses with higher potential pollutant loads (identified in 310 CMR 22) are limited along Atlantic Avenue and no drinking water supplies or wellhead protection areas (See Item #6 below) occur along the project corridor. Proposed BMP erosion and sedimentation control (ESC) measures (See Item #8 below) will protect coastal resources during construction of the proposed project to the maximum extent practicable.

6. *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply ...*

No DEP Zone II or Interim Wellhead Protection Areas of public water supplies are associated with the property.

7. *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*



The project will comply with the applicable 2008 Massachusetts Stormwater Management Standards to the maximum extent practicable as required for redevelopment projects. The Engineering Management Report (See Appendix I) includes a discussion of conformance with MA Stormwater Performance Standards.

8. *A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation and pollution prevention plan) shall be developed and implemented.*

A Stormwater Pollution Prevention Plan (SWPPP) will be prepared for the project by the general construction contractor prior to the commencement of construction. Installation of Best Management Practice (BMPs) erosion and sediment control (ESC) measures at project limits (Section 2.5) of work and around existing stormwater features prior to ground disturbance will protect surface water resources during construction activities associated with road construction. In addition, minimal clearing is required due to work located primarily within/adjacent to paved road surfaces, and vegetation proposed to be cleared is limited primarily to landscaped trees and shrubs and will not affect sections of natural, forested areas. Maintenance of ESC measures until all bare areas are fully stabilized and/or revegetated following construction in addition to long-term operation and maintenance of proposed stormwater features (See Item #9 below) will ensure protection to surface water resources within the project area post construction. Improvements to the storm drainage system will improve the water quality of stormwater runoff following construction as well.

9. *A long-term operation and maintenance plan shall be developed and implemented to ensure that the stormwater management system functions as designed.*

A long-term operations and maintenance plan to ensure function of the proposed stormwater system has been provided in the Engineering Management Report (See Appendix I).

10. *All illicit discharges to the stormwater management system are prohibited.*

No illicit discharges to the stormwater management system are anticipated during construction. The project will be subject to weekly SWPPP reporting (see Item 8 above) during construction, and any illicit discharges to the stormwater management systems will be documented and corrective action taken.

### **2.6.3 Compliance Summary**

In summary, the proposed project will occur within or immediately adjacent to the existing, paved, Atlantic Avenue right-of-way. The stormwater management design and incorporated Best Management Practices will ensure that discharges from the project during and post-construction will improve water quality over existing conditions. Further, the proposed work will not adversely impact wildlife and their habitat due to the limited expansion of the paved road surface/sidewalk within existing, maintained road rights-of-way. Therefore, environmental

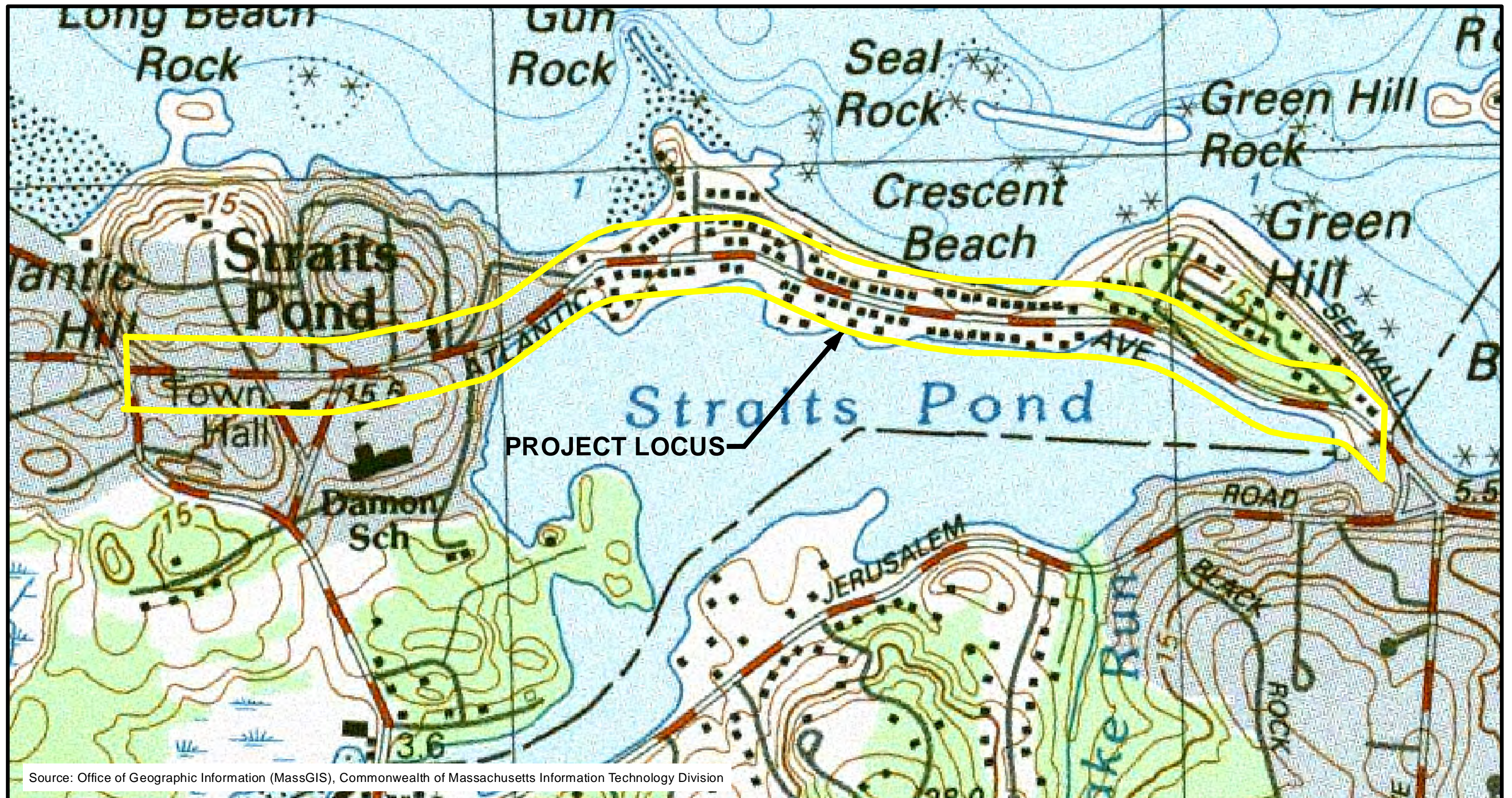
conditions within the project limits along Atlantic Avenue will be improved over existing conditions per the interests identified under the §401 WQC Program (314 CMR 9.00).

## Section 3

### *Figures*

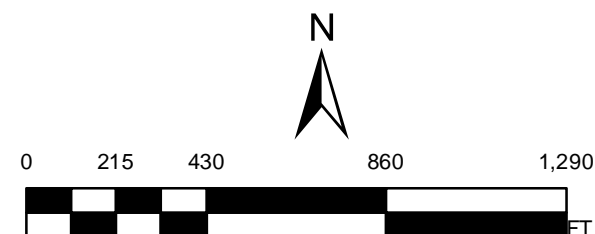
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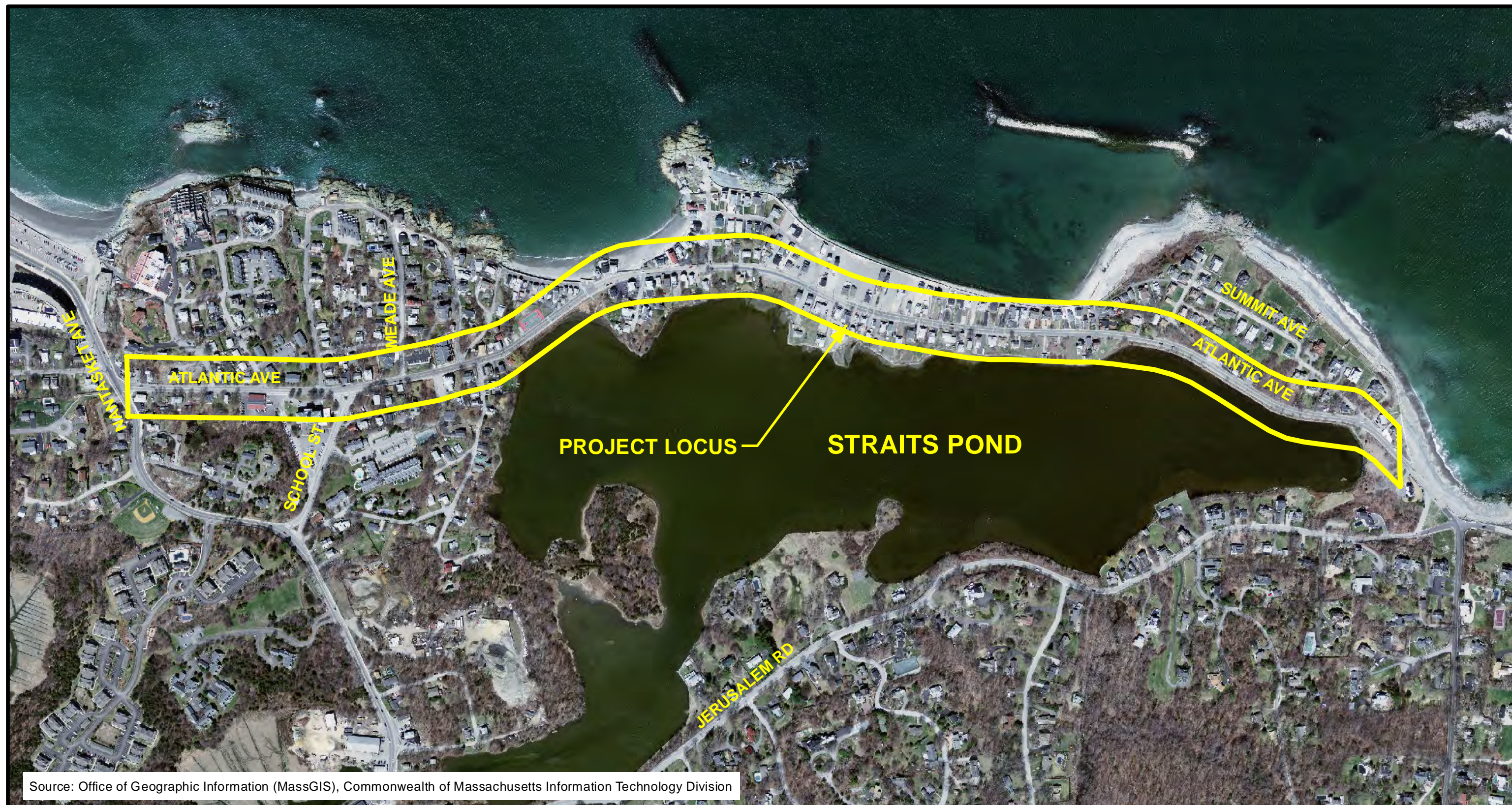


**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 1. USGS TOPOGRAPHY MAP**

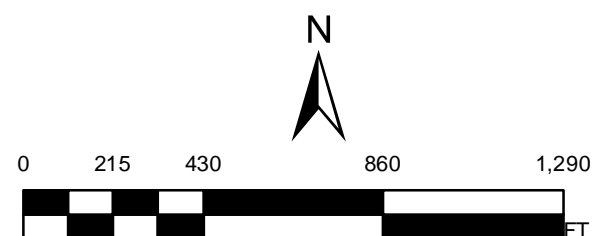




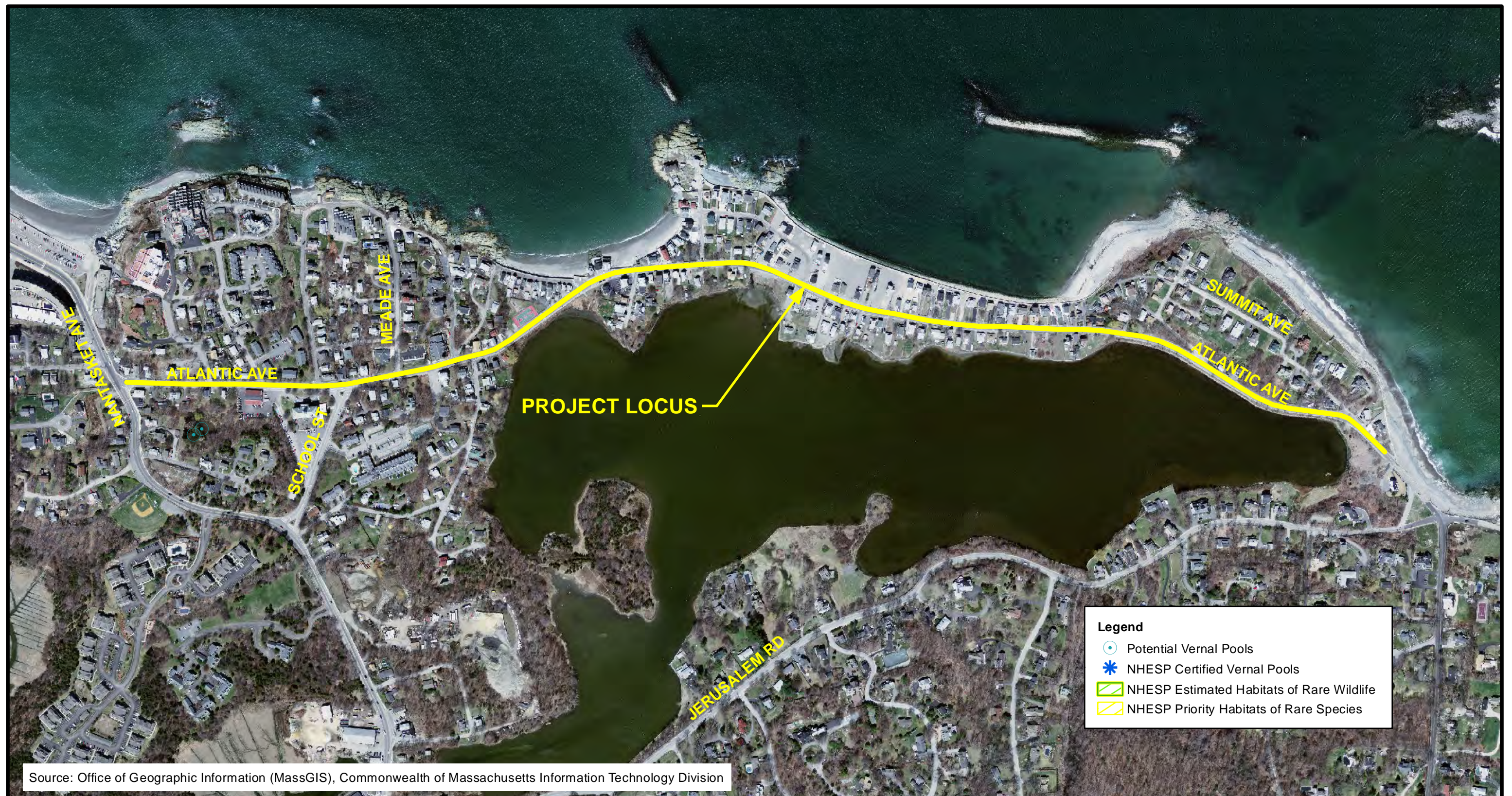


**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 2. LOCUS MAP**

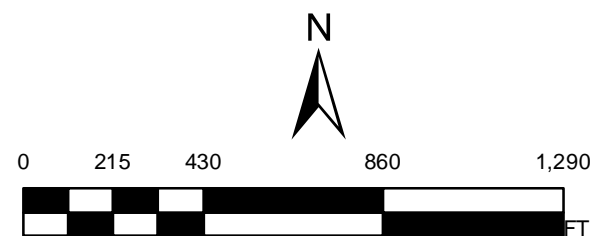




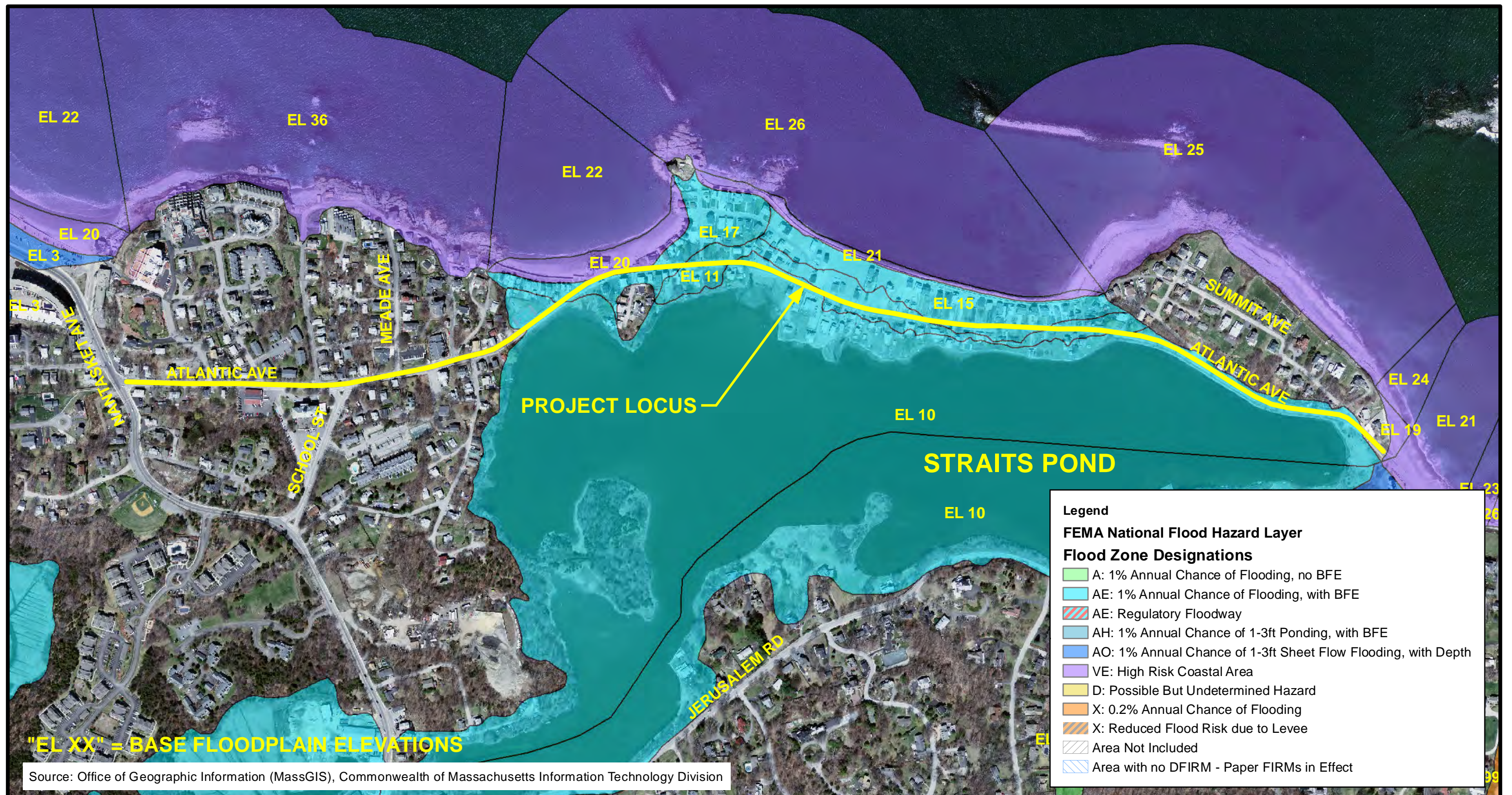


**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 3. NHESP HABITATS**

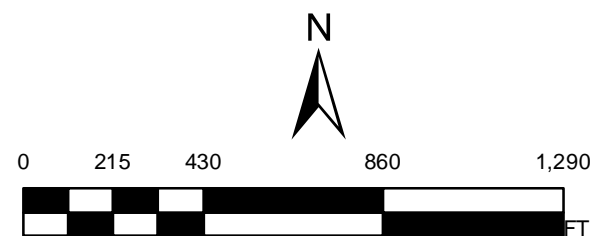




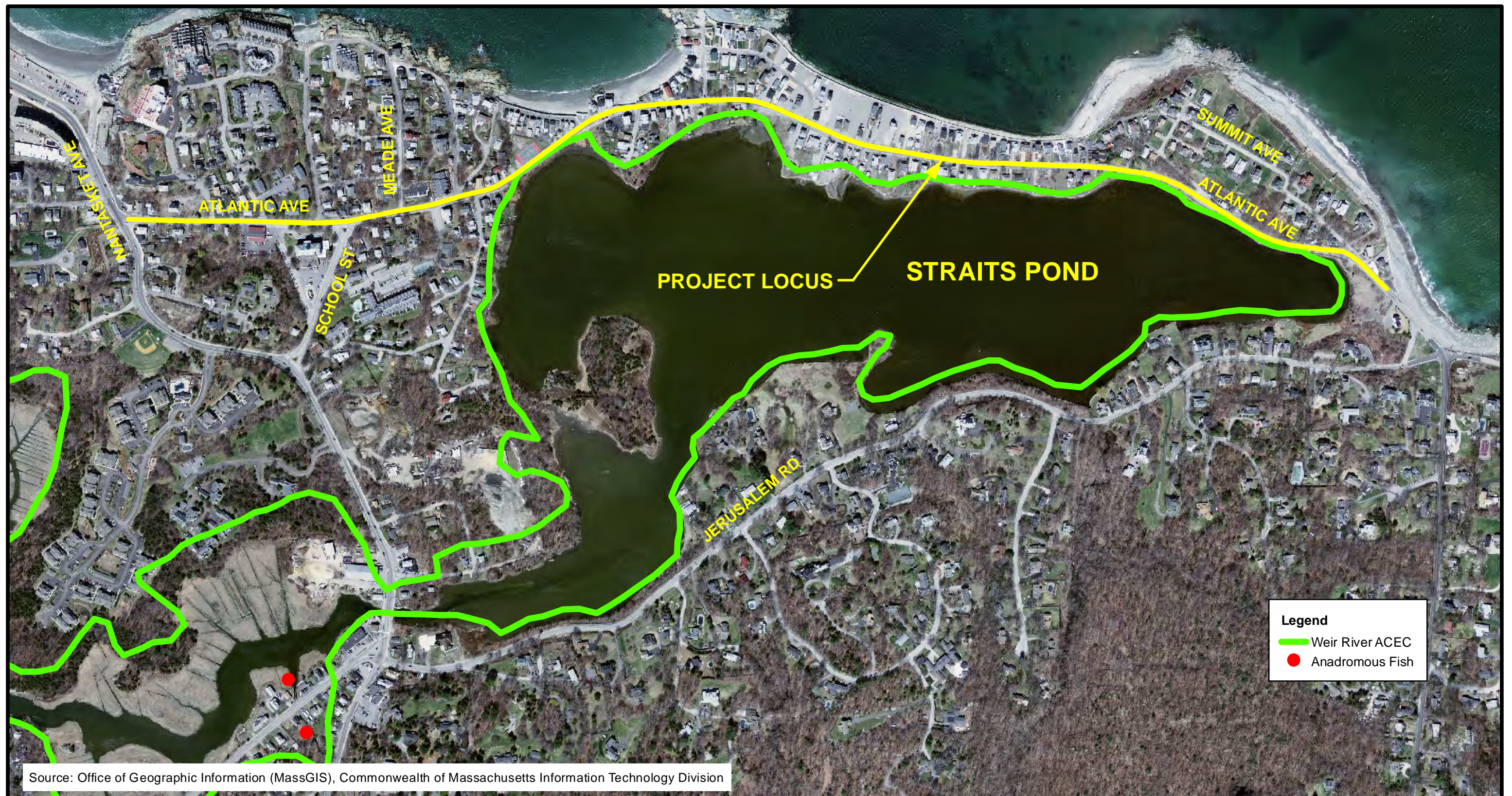


**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 4. FEMA FLOODPLAIN ZONES**

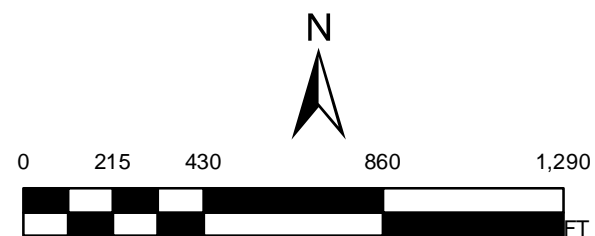






**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 5. ACEC & ANADROMOUS FISH RUN**

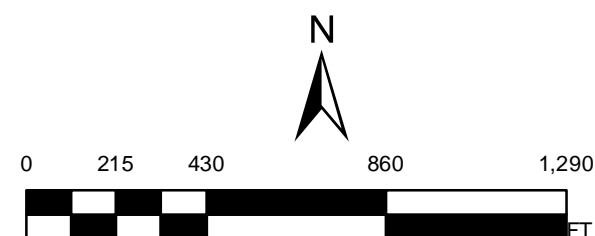




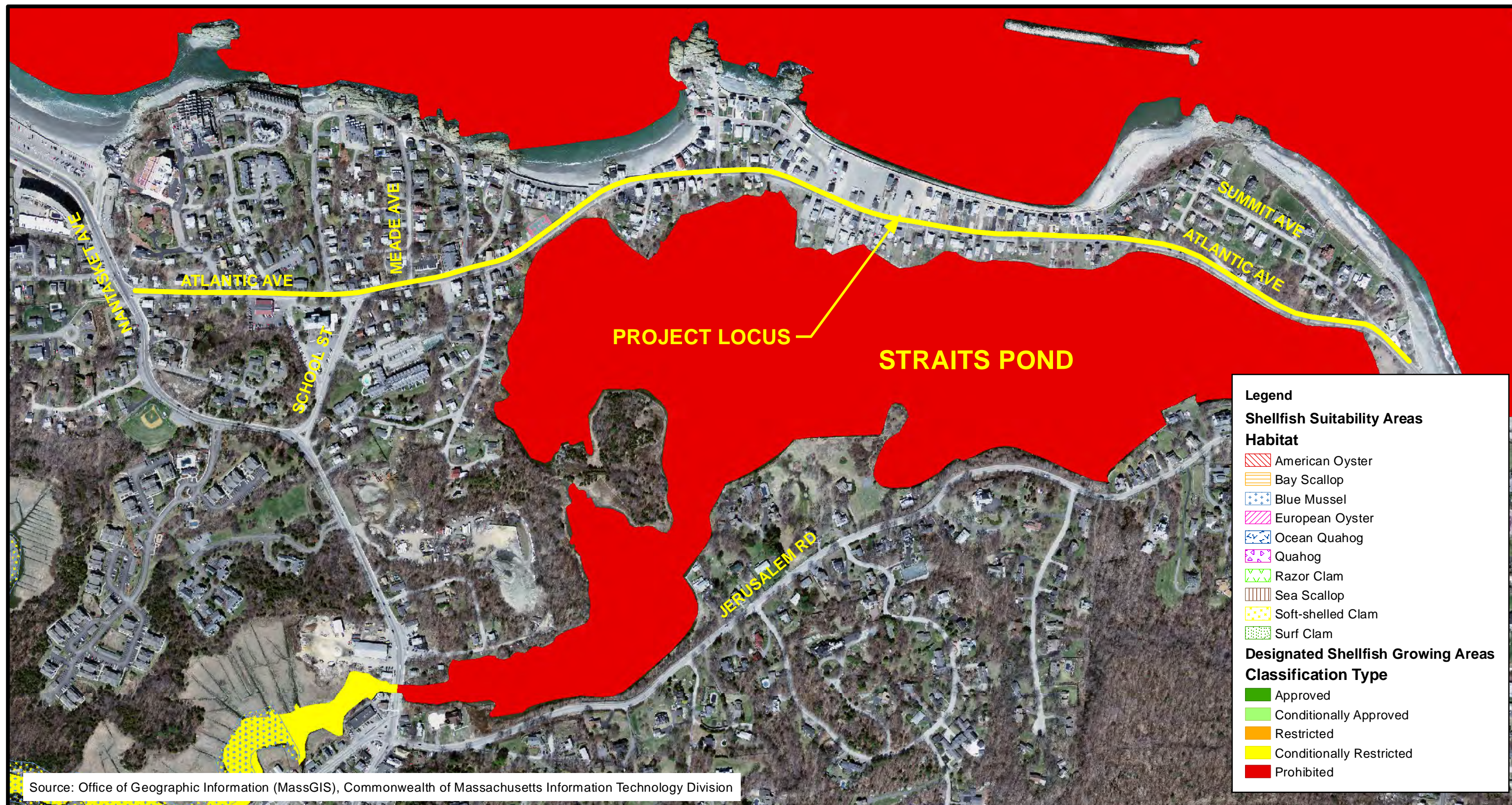


**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**Figure 6. TIDAL JURISDICTION**

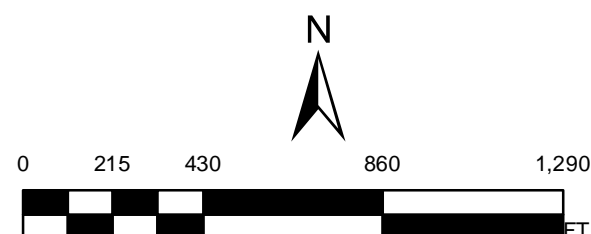






**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 7. SHELLFISH HABITAT & GROWING AREAS**







TOWN OF HULL, MA  
 ATLANTIC AVENUE RECONSTRUCTION  
 FIGURE 8. STORMWATER OUTLET LOCATIONS



## Section 4

### *Appendices*

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## Appendix A

### *Agency Permit Matrix*

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**FEDERAL, STATE AND LOCAL PERMITS/REVIEW**  
**PROPOSED TAUNTON RIVER PIPELINE REPLACEMENT, FALL RIVER & SOMERSET, MA**

Permit	Issuing Agency	Status
<b>Federal Permits/Review</b>		
Section 404 permit Pre-Construction Notification	Army Corps of Engineers (Corps) New England District	Filed 02/08/21
Notification/Clearance	National Register of Historic Places/MA Historical Commission (SHPO)	Finding of "No Effect" 12/17/12
Notification/Clearance	Wompanoag Tribe of Gay Head (Aquinnah) (THPO)	Filed 11/04/09
Notification/Clearance	Mashpee Wompanoag Tribe (THPO)	Filed 11/04/09
Notification/Clearance	Hull Historical Commission	Filed 11/04/09
Notification/Clearance	Massachusetts Division of Marine Fisheries	Filed 03/31/10
Notification/Clearance	U. S. Fish and Wildlife Service	Received Comments 01/02/09 No Species/Habitat Present
Notification/Clearance	Massachusetts Natural Heritage and Endangered Species Program	Received Comments 12/08/09 No Mapped Habitat Present
<b>Massachusetts State Permits/Review</b>		
Environmental Notification Form (ENF)	MA Executive Office of Energy and Environmental Affairs (EOEEA) – MA Environmental Policy Act (MEPA)	Filed 01/29/21
Chapter 91 – Waterways License or Permit	MA Dept. of Env. Protection Wetlands and Waterways Program	Filed 02/03/21
§401 Water Quality Certification	MA Dept. of Env. Protection Div. of Water Pollution Control Program	Filed 02/09/21
<b>Local Permits/Review</b>		
Notice of Intent MGL 131, Section 40	Town of Hull Conservation Commission - Order of Conditions	Order of Conditions Issued 12/14/20

## **Appendix B**

### ***DEP Transmittal Form and Public Notifications***

---



Enter your transmittal number

X287362

Transmittal Number

Your unique Transmittal Number can be accessed online: <http://mass.gov/dep/service/online/trasmfrm.shtml>

## Massachusetts Department of Environmental Protection

# Transmittal Form for Permit Application and Payment

1. Please type or print. A separate Transmittal Form must be completed for each permit application.

2. Make your check payable to the Commonwealth of Massachusetts and mail it with a copy of this form to: DEP, P.O. Box 4062, Boston, MA 02211.

3. Three copies of this form will be needed.

**Copy 1 - the original** must accompany your permit application. **Copy 2** must accompany your fee payment. **Copy 3** should be retained for your records

4. Both fee-paying and exempt applicants must mail a copy of this transmittal form to:

MassDEP  
P.O. Box 4062  
Boston, MA  
02211

**\* Note:**  
For BWSC Permits, enter the LSP.

## A. Permit Information

BRP WW 10

\$401 Water Quality Certificate Application

1. Permit Code: 7 or 8 character code from permit instructions

2. Name of Permit Category

Road Reconstruction and Related Work - Atlantic Avenue Reconstruction Project, Hull, MA

3. Type of Project or Activity

## B. Applicant Information – Firm or Individual

Town of Hull Department of Public Works

1. Name of Firm - Or, if party needing this approval is an individual enter name below:

Stigliani

Joseph

A.

2. Last Name of Individual

3. First Name of Individual

4. MI

9 Nantasket Avenue

5. Street Address

Hull

MA

02045

781-925-0900

6. City/Town

7. State

8. Zip Code

9. Telephone #

10. Ext. #

Same

jstigliani@town.hull.ma.us

11. Contact Person

12. e-mail address (optional)

## C. Facility, Site or Individual Requiring Approval

Same

1. Name of Facility, Site Or Individual

2. Street Address

3. City/Town

4. State

5. Zip Code

6. Telephone #

7. Ext. #

8. DEP Facility Number (if Known)

9. Federal I.D. Number (if Known)

10. BWSC Tracking # (if Known)

## D. Application Prepared by (if different from Section B)\*

CHA Consulting, Inc.

1. Name of Firm Or Individual

141 Longwater Drive, Suite 104

2. Address

Norwell

MA

02061

781-982-5400

3. City/Town

4. State

5. Zip Code

6. Telephone #

7. Ext. #

John G. Morgan, Jr.

8. Contact Person

9. LSP Number (BWSC Permits only)

## E. Permit - Project Coordination

1. Is this project subject to MEPA review? ☒ yes ☐ no  
If yes, enter the project's EOEA file number - assigned when an Environmental Notification Form is submitted to the MEPA unit:

ENF Filed 01/29/21

EOEA File Number

## F. Amount Due

### Special Provisions:

1. ☒ **Fee Exempt** (city, town or municipal housing authority)(state agency if fee is \$100 or less).  
*There are no fee exemptions for BWSC permits, regardless of applicant status.*
2. ☐ **Hardship Request** - payment extensions according to 310 CMR 4.04(3)(c).
3. ☐ **Alternative Schedule Project** (according to 310 CMR 4.05 and 4.10).
4. ☐ **Homeowner** (according to 310 CMR 4.02).

DEP Use Only

Permit No:

Rec'd Date:

Reviewer:

NA

Check Number

NA

Dollar Amount

NA

Date



Pursuant to 33 U.S.C. 1341 and M.G.L. c. 21 §§ 26 – 53, notice is given of a §401 Water Quality Certification application for the Atlantic Avenue Reconstruction Project by the Town of Hull Department of Public Works in conjunction with MassDOT-Highway Division. The Applicant is proposing reconstruction and related work along the approximately 1.3-mile length of Atlantic Avenue that includes: roadway reconstruction, improvements to the existing stormwater drainage system, intersection safety modifications and enhancement of bicycle and pedestrian accommodations, new signing, striping, curbing and guardrail replacement where necessary. Selective clearing and thinning are proposed to maintain clear zones and intersection sight distance. The applicant is the Town of Hull Department of Public Works, 9 Nantasket Avenue, Hull, MA 02045. Additional information may be obtained from John Morgan at CHA Consulting, Inc., 141 Longwater Drive, Suite 104, Norwell, MA 02061, telephone number 781-982-5437. Written comments should be addressed to the MassDEP – Southeast Regional Office, 20 Riverside Drive, Route 105, Lakeville, MA 02347, within twenty-one days of this notice.

Any group of ten persons, any aggrieved person, or any governmental body or private organization with a mandate to protect the environment who submits written comments may appeal the Department's Certification. Failure to submit written comments before the end of the public comment period may result in the waiver of any right to an adjudicatory hearing.

## **Appendix C**

### ***Agency Consultations***

---

November 4, 2009

Richard Hartley  
Massachusetts Division of Fisheries & Wildlife  
1 Rabbit Run Road  
Westborough, MA 01581

RE: Atlantic Ave. – Hull – Resurfacing  
And Improvements (Project File No. 601607)  
Section 106 Review


Dear Mr. Hartley:

The Massachusetts Highway Department (MassHighway) and the Town of Hull propose to perform roadway improvements along Atlantic Avenue. It is anticipated that this project will be supported in part with federal funds and will require review, therefore, under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided for the Massachusetts Division of Fisheries & Wildlife's review in compliance with the regulations governing Section 106.

The Atlantic Avenue Reconstruction project, includes the reconstruction of Atlantic Avenue from its intersection with Nantasket Avenue (Route 228), east to the Cohasset Town Line. The total project length is approximately 6300 feet. The project consists of pavement rehabilitation and widening. The project also consists of related items of work, including sidewalk construction, drainage upgrades, and new signing and striping.

Attached is a USGS locus map showing the project area, along with a narrative summarizing the purpose and need, existing conditions, and proposed improvements. If you require additional information, please contact Coler & Colantonio Inc. at (781) 982-5478.

Sincerely,

  
Melissa Brindley  
Coler & Colantonio, Inc.

atts: locus map, scope of work  
xcs: Marie Rose, Director of Project Management

November 4, 2009

Rick O'Donnell, Chairman  
Town of Hull Historical Commission  
253 Atlantic Ave, Town Hall,  
Hull, MA 02045

RE: Atlantic Ave. – Hull – Resurfacing  
And Improvements (Project File No. 601607)  
Section 106 Review

Dear Mr. O'Donnell:

The Massachusetts Highway Department (MassHighway) and the Town of Hull propose to perform roadway improvements along Atlantic Avenue. It is anticipated that this project will be supported in part with federal funds and will require review, therefore, under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided for the Hull Historical Commission's review in compliance with the regulations governing Section 106.

The Atlantic Avenue Reconstruction project, includes the reconstruction of Atlantic Avenue from its intersection with Nantasket Avenue (Route 228), east to the Cohasset Town Line. The total project length is approximately 6300 feet. The project consists of pavement rehabilitation and widening. The project also consists of related items of work, including sidewalk construction, drainage upgrades, and new signing and striping.

MassHighway and the Town of Hull request that the Hull Historical Commission review the enclosed materials at their earliest convenience, and solicits any comments that the Commission wishes to make regarding this project. Written comments should be submitted to: Frank Tramontozzi, P.E., Chief Engineer, Massachusetts Highway Department, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton.

If you have any questions concerning the enclosed project information, please feel free to contact Pamela Haznar of MassHighway's Project Management Section. If you have any questions concerning the Section 106 process, please feel free to contact Jeffrey Shrimpton (617 973-7497) of MassHighway's Cultural Resources Unit.

Sincerely,

  
Melissa Brindley  
Coler & Colantonio, Inc.

atts: locus map, scope of work  
xcs: B. Simon, DSHPO, MHC, with atts.  
J. Shrimpton, MassHighway, with atts.

November 4, 2009

Mr. George Green Jr., THPO  
Mashpee Wampanoag Indian Tribe Council  
483 Great Neck Road, Couth  
P.O. Box 1048  
Mashpee, MA 02649

RE: Atlantic Ave. – Hull – Resurfacing  
And Improvements (Project File No. 601607)  
Section 106 Review

Dear Mr. Green:

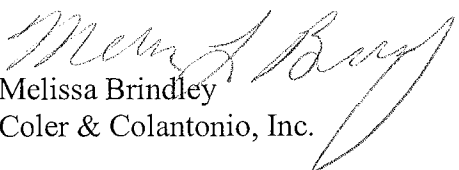
The Massachusetts Highway Department (MassHighway) and the Town of Hull propose to perform roadway improvements along Atlantic Avenue. It is anticipated that this project will be supported in part with federal funds and will require review, therefore, under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided for the Mashpee Wampanoag THPO's review in compliance with the regulations governing Section 106.

The Atlantic Avenue Reconstruction project, includes the reconstruction of Atlantic Avenue from its intersection with Nantasket Avenue (Route 228), east to the Cohasset Town Line. The total project length is approximately 6300 feet. The project consists of pavement rehabilitation and widening. The project also consists of related items of work, including sidewalk construction, drainage upgrades, and new signing and striping.

MassHighway & the Town of Hull request that the Mashpee Wampanoag THPO review the enclosed materials at their earliest convenience, and solicits any comments that the THPO wishes to make regarding this project. Written comments should be submitted to: Frank Tramontozzi, P.E., Chief Engineer, Massachusetts Highway Department, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton.

If you have any questions concerning the Section 106 process, please feel free to contact Geoffrey Fulgione (617 973-8253) of MassHighway's Cultural Resources Unit.

Sincerely,

  
Melissa Brindley  
Coler & Colantonio, Inc.

atts: scope of work, locus map  
xcs: B. Simon, DSHPO, MHC, with atts.  
J. Shrimpton, MassHighway, with atts.

November 4, 2009

Ms. Bettina Washington, THPO  
Wampanoag Tribe of Gay Head (Aquinnah)  
20 Black Brook Road.  
Aquinnah, MA 02535-9701

RE: Atlantic Ave. – Hull – Resurfacing  
And Improvements (Project File No. 601607)  
Section 106 Review

Dear Ms. Washington:

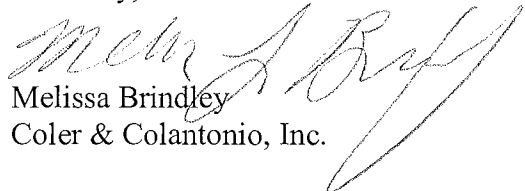
The Massachusetts Highway Department (MassHighway) and the Town of Hull propose to perform roadway improvements along Atlantic Avenue. It is anticipated that this project will be supported in part with federal funds and will require review, therefore, under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided for the Wampanoag THPO's review in compliance with the regulations governing Section 106.

The Atlantic Avenue Reconstruction project, includes the reconstruction of Atlantic Avenue from its intersection with Nantasket Avenue (Route 228), east to the Cohasset Town Line. The total project length is approximately 6300 feet. The project consists of pavement rehabilitation and widening. The project also consists of related items of work, including sidewalk construction, drainage upgrades, and new signing and striping.

MassHighway & the Town of Hull request that the Wampanoag THPO review the enclosed materials at their earliest convenience, and solicits any comments that the THPO wishes to make regarding this project. Written comments should be submitted to: Frank Tramontozzi, P.E., Chief Engineer, Massachusetts Highway Department, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton.

If you have any questions concerning the Section 106 process, please feel free to contact Geoffrey Fulgione (617 973-8253) of MassHighway's Cultural Resources Unit.

Sincerely,

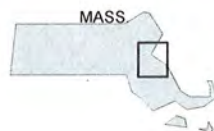
  
Melissa Brindley  
Coler & Colantonio, Inc.

atts: scope of work, locus map  
xcs: B. Simon, DSHPO, MHC, with atts.  
J. Shrimpton, MassHighway, with atts.





**COLER & COLANTONIO** INC.  
ENGINEERS AND SCIENTISTS



— Project Corridor  
- - - Town Line

Project Locus Map

Town of Hull  
Atlantic Avenue Reconstruction

Figure 1



March 31, 2010

Ms. Melanie Griffin  
Massachusetts Division of Marine Fisheries  
251 Causeway Street, Suite 400  
Boston, MA 02114-2152

RE: Atlantic Ave. – Hull – Resurfacing  
And Improvements (Project File No. 601607)  
Section 106 Review

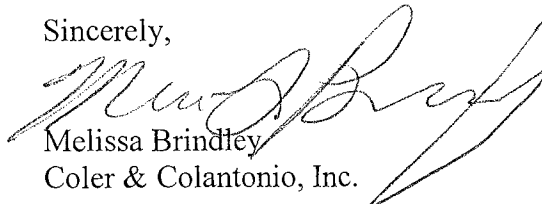
Dear Ms. Griffin:

The Massachusetts Highway Department (MassHighway) and the Town of Hull propose to perform roadway improvements along Atlantic Avenue. It is anticipated that this project will be supported in part with federal funds and will require review, therefore, under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided for the Massachusetts Division of Marine Fisheries' review in compliance with the regulations governing Section 106.

The Atlantic Avenue Reconstruction project, includes the reconstruction of Atlantic Avenue from its intersection with Nantasket Avenue (Route 228), east to the Cohasset Town Line. The total project length is approximately 6300 feet. The project consists of pavement rehabilitation and widening. The project also consists of related items of work, including sidewalk construction, drainage upgrades, and new signing and striping.

Attached is a USGS locus map showing the project area, along with a narrative summarizing the purpose and need, existing conditions, and proposed improvements. If you require additional information, please contact Coler & Colantonio Inc. at (781) 982-5478.

Sincerely,



Melissa Brindley  
Coler & Colantonio, Inc.

atts: locus map, scope of work  
xcs: Marie Rose, Director of Project Management





# United States Department of the Interior



FISH AND WILDLIFE SERVICE  
New England Field Office  
70 Commercial Street, Suite 300  
Concord, New Hampshire 03301-5087  
<http://www.fws.gov/northeast/newenglandfieldoffice>

January 2, 2009

To Whom It May Concern:

This project was reviewed for the presence of federally-listed or proposed, threatened or endangered species or critical habitat per instructions provided on the U.S. Fish and Wildlife Service's New England Field Office website:

<http://www.fws.gov/northeast/newenglandfieldoffice/EndangeredSpec-Consultation.htm>

Based on the information currently available, no federally-listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service (Service) are known to occur in the project area(s). Preparation of a Biological Assessment or further consultation with us under Section 7 of the Endangered Species Act is not required.

This concludes the review of listed species and critical habitat in the project location(s) and environs referenced above. No further Endangered Species Act coordination of this type is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

Thank you for your cooperation. Please contact Mr. Anthony Tur at 603-223-2541 if we can be of further assistance.

Sincerely yours,



Thomas R. Chapman  
Supervisor  
New England Field Office

## FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Barnstable	Piping Plover	Threatened	Coastal Beaches	All Towns
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	All Towns
	Northeastern beach tiger beetle	Threatened	Coastal Beaches	Chatham
	Sandplain gerardia	Endangered	Open areas with sandy soils.	Sandwich and Falmouth.
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Bourne (north of the Cape Cod Canal)
Berkshire	Bog Turtle	Threatened	Wetlands	Egremont and Sheffield
Bristol	Piping Plover	Threatened	Coastal Beaches	Fairhaven, Dartmouth, Westport
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Fairhaven, New Bedford, Dartmouth, Westport
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Taunton
Dukes	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	All Towns
	Piping Plover	Threatened	Coastal Beaches	All Towns
	Northeastern beach tiger beetle	Threatened	Coastal Beaches	Aquinnah and Chilmark
	Sandplain gerardia	Endangered	Open areas with sandy soils.	West Tisbury
Essex	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Gloucester, Essex and Manchester
	Piping Plover	Threatened	Coastal Beaches	Gloucester, Essex, Ipswich, Rowley, Revere, Newbury, Newburyport and Salisbury
Franklin	Northeastern bulrush	Endangered	Wetlands	Montague
	Dwarf wedgemussel	Endangered	Mill River	Whately
Hampshire	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Hadley
	Puritan tiger beetle	Threatened	Sandy beaches along the Connecticut River	Northampton and Hadley
	Dwarf wedgemussel	Endangered	Rivers and Streams.	Hadley, Hatfield, Amherst and Northampton
Hampden	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Southwick
Middlesex	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Groton
Nantucket	Piping Plover	Threatened	Coastal Beaches	Nantucket
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Nantucket
	American burying beetle	Endangered	Upland grassy meadows	Nantucket
Plymouth	Piping Plover	Threatened	Coastal Beaches	Scituate, Marshfield, Duxbury, Plymouth, Wareham and Mattapoisett
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Kingston, Middleborough, Carver, Plymouth, Bourne, Wareham, Halifax, and Pembroke
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Plymouth, Marion, Wareham, and Mattapoisett.
Suffolk	Piping Plover	Threatened	Coastal Beaches	Winthrop
Worcester	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Leominster

- Eastern cougar and gray wolf are considered extirpated in Massachusetts.
- Endangered gray wolves are not known to be present in Massachusetts, but dispersing individuals from source populations in Canada may occur statewide.
- Critical habitat for the Northern Red-bellied Cooter is present in Plymouth County.

**Revised 06/22/2009**



**MassWildlife**

*Commonwealth of Massachusetts*

# **Division of Fisheries & Wildlife**

Wayne F. MacCallum, *Director*

Melissa Brindley  
Coler & Colantonio, Inc.  
101 Accord Park Drive  
Norwell, MA 02061

December 8, 2009

**RE: Resurfacing Atlantic Avenue  
Hull, MA  
NHESP Tracking No. 09-27469**

Dear Ms. Brindley:

Thank you for contacting the Division of Fisheries and Wildlife for information relative to the above referenced project. There are no freshwater fisheries resources within the vicinity of the proposed project. For information on the presence of marine or anadromous species, we recommend you contact the Division of Marine Fisheries at (617) 626-1520.

Best management practices for erosion and sedimentation control must be adhered to for all phases of construction to minimize potential impacts to the fisheries resources. To the greatest extent practicable, all in stream work should be conducted during low flow periods throughout the year. Times of year when stream flow is high due to extended rain and/or snow melt events should be avoided. If the projects results in the replacement of existing culverts, the culvert replacement should meet the replacement recommendations found in the "Massachusetts River and Stream Crossing Standards: Technical Guidelines, August 6, 2004" (the Standards) including, a minimum height of 6 feet, openness ratio of 0.5–0.75, natural bottom substrates through the crossing structure, and spanning 1.2 times the bank-full width to the greatest extent practical. If the project results in the placement of new culverts, the new crossing structure should, at minimum, meet the general standards for new crossing and strive for the optimum standards whenever possible including, a minimum height of 6 feet, openness ratio of 0.5–0.75, natural bottom substrates through the crossing structure, and spanning 1.2 times the bank-full width to the greatest extent practical. The Standards can be found at [http://www.umass.edu/nrec/pdf\\_files/guidelines\\_river\\_stream\\_crossings.pdf](http://www.umass.edu/nrec/pdf_files/guidelines_river_stream_crossings.pdf). Also, if the project will alter the streambed, we request that the existing grade be maintained.

At this time the site is not mapped as Priority or Estimated Habitat and the NHESP database does not contain any state-listed species records in the immediate vicinity of this site. This evaluation is based on the most recent information available in

[www.masswildlife.org](http://www.masswildlife.org)

Division of Fisheries and Wildlife

Field Headquarters, One Rabbit Hill Road, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890

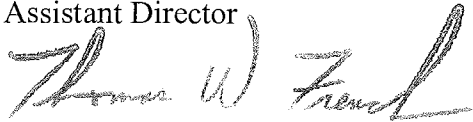
*An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement*

the NHESP database, which is constantly being expanded and updated through ongoing research and inventory. Should your site plans change, or new rare species information become available, this evaluation may be reconsidered.

For questions regarding the Natural Heritage & Endangered Species Program, please contact Amanda Veinotte at (508) 389-6380. For questions regarding fisheries issues, please contact Richard Hartley at (508) 389-6330.

Sincerely,

Thomas W. French, PhD  
Assistant Director

A handwritten signature in cursive script, reading "Thomas W. French". The signature is written in dark ink and is positioned below the printed name and title.

Cc. Hull Conservation Commission

# CULTURAL RESOURCES PROJECT RECORD

City/Town	Hull	Project #	601607	Date Cleared	12/17/2012
Project Name	Atlantic Avenue	Date Filed	12/17/2012	Finding Under Review	<input type="checkbox"/>
		FHWA to MHC			
Project Type	Highway Reconstr - No Added Capacity	Early Coord. Letter Sent:	<input checked="" type="checkbox"/>	Reviewer	JPS
Review	Section 106 (PA)	Comment Received:		Consultant	
Finding:	Stip VB - No historic properties affected	<input type="checkbox"/> MHC <input type="checkbox"/> LHC			
Comment	Early environmental coordination letters sent on November 4, 2009, to Hull Historical Commission (cc to SHPO), Mashpee THPO, and Wampanoag SHPO. No responses received by MassDOT.				

Determination based on: ☒ Scope of Work ☒ Plan ☒ Inventory ☐ Site Visit ☐ Archaeological Survey

*Attach appropriate documentation for checked items*

## Projects Requiring No Massachusetts SHPO Review

### Programmatic Agreement, Appendix 1 (check all that apply) :

- |   |   |
|---|---|
| <input type="checkbox"/> 1) Interstate bridge or roadway projects                         | <input type="checkbox"/> 16) Bridge (less than 20' span)                  |
| <input type="checkbox"/> 2) Resurfacing, repair existing roadways                         | * <input type="checkbox"/> 17) Highway safety improvement                 |
| * <input type="checkbox"/> 3) Reconstruction on existing roadway                          | <input type="checkbox"/> 18) Drainage system element                      |
| * <input type="checkbox"/> 4) Roadway geometrics, intersections                           | * <input type="checkbox"/> 19) Traffic signal, safety improvement         |
| * <input type="checkbox"/> 5) Curbs and sidewalks   | * <input type="checkbox"/> 20) Intelligent Transportation System project  |
| <input type="checkbox"/> 6) Pavement markings, rumble strips, etc                         | <input type="checkbox"/> 21) Rest area, maintenance facility              |
| <input type="checkbox"/> 7) Curbs, sidewalks (MAAB, ADA)                                  | * <input type="checkbox"/> 22) Bicycle, pedestrian lane, path or facility |
| * <input type="checkbox"/> 8) Removal of trees  | <input type="checkbox"/> 23) Lighting system                              |
| <input type="checkbox"/> 9) Landscaping   | <input type="checkbox"/> 24) Sign   |
| <input type="checkbox"/> 10) Utilities  | <input type="checkbox"/> 25) Hazardous waste                              |
| <input type="checkbox"/> 11) Railroad crossing  | <input type="checkbox"/> 26) Highway fencing                              |
| <input type="checkbox"/> 12) Stream stabilization and restoration                         | <input type="checkbox"/> 27) Emergency repair                             |
| <input type="checkbox"/> 13) Wetland mitigation area                                      | <input type="checkbox"/> 28) Erosion control                              |
| * <input type="checkbox"/> 14) Bridge (NR "Not Eligible" or "Conditionally Not Eligible") | <input type="checkbox"/> 29) Noise barrier                                |
| * <input type="checkbox"/> 15) Bridge (concrete slab post 1900, steel stringer)           | * National Register eligibility evaluation required                       |

-OR-

### No Historic Properties Affected

#### Programmatic Agreement Stipulation V.B. (check one):

- ☐ No NR listed or -eligible properties within Area of Potential Effect
- ☒ No effect on National Register listed or -eligible properties

Reviewer's Initials:



## Summary of MassDOT Highway Division Finding (Appendix 1 and Section V.B. Projects only)

This project proposes to reconstruct the full length of Atlantic Avenue in Hull from the Cohasset Town Line on the east to the T-intersection at Nantasket Avenue on the west, a distance of 1.3 miles. The project consists of full-depth roadway reconstruction, minor widening within the existing highway layout to create uniform roadway widths, geometric improvements at intersections, sidewalk construction within the existing highway layout, and replacement or adjustment of existing drainage structures.

A review of the National Register of Historic Places revealed no listed properties within or adjacent to the project area. A review of the Inventory of Historic and Archaeological Assets of the Commonwealth revealed that the project area passes through Area E, known as the Atlantic Avenue Streetscape, which is a relatively intact grouping of eleven modest late-19th century wood-frame vacation houses on the neck of land between Straits Pond and the Atlantic Ocean. Area E may be eligible for listing in the National Register of Historic Places, although more research and a site visit would be necessary to make a definitive eligibility determination.

The project area also is adjacent to the Hull Town Hall (HUL.21), a monumental Neo-Georgian style government building constructed in 1921. The Hull Town Hall is characterized by a tall cupola on its main hip roof and a two-story pedimented front portico with four Corinthian columns. The building appears to be individually eligible for listing in the National Register of Historic Places. The Hull Town Hall is situated on a prominent triangular parcel bounded by Atlantic Avenue on the north, School Street on the east, and Atlantic House Road on the west. Proposed work in the vicinity of the Hull Town Hall includes bumping out the corners of the two Atlantic Avenue intersections on either side of the Town Hall to create more perpendicular configurations. This work will be undertaken within the existing highway layout and will not affect the character-defining features of the NR-eligible Hull Town Hall.

Other inventoried properties adjacent to the project area include three late-19th century wood-frame dwellings at 86 Atlantic Avenue (HUL.9), 88 Atlantic Avenue (HUL.10), and 227 Atlantic Avenue (HUL.16). None of these properties appears to exhibit the distinguishing characteristics necessary for individual listing in the National Register, nor do they appear to be part of any NR-eligible historic district. A fourth inventoried property at 2 Atlantic Avenue (HUL.1) appears to have been demolished.

All of the inventoried properties described above, including the Hull Town Hall and the Atlantic Avenue Streetscape, also are included in a larger area that has been inventoried as the Straits Pond Area (HUL.A). Area A as a whole does not appear to be eligible for listing in the National Register because of multiple demolitions and modern infill construction, although as noted above, the potentially NR-eligible Atlantic Avenue Streetscape (HUL.E) and the Hull Town Hall (HUL.21) are located within Area A.

A review of the MHC archaeological base maps revealed two recorded pre-Contact sites north of Atlantic Avenue near the westerly end of the project area: the Atlantic Ledges Site (19-PL-1) on the Atlantic shore and Atlantic Hill (19-PL-268) north of Town Hall, both north of Atlantic Avenue near the Atlantic shore toward the westerly end of the project area. The project area also is in the vicinity of one recorded historic archaeological site: the Atlantic Hill Native Cemetery (HUL.HA.1), which is located approximately 800' north of the Hull Town Hall. Little or no archaeological potential may be ascribed to the project area based on the nature of the work, past roadway construction, and roadside development. This project requires no further review under Stipulation V(B) ("No Effect on National Register –listed or –eligible properties") of the Section 106 Programmatic Agreement.

Reviewer's Initials: \_\_\_\_\_

## **Appendix D**

### ***Site Photographs***

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## Atlantic Avenue Restoration Project

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Westerly View of Straits Pond and Wetland A/Salt Marsh at East End of Project at Hull/Cohasset Town Line



Northwesterly View of Straits Pond and Wetland A/Salt Marsh at East End of Project at Hull/Cohasset Town Line





Easterly View of Atlantic Avenue and Straits Pond/Wetland A (East End of Straits Pond)  
Opposite Green Hill/Summit Avenue West of the Hull/Cohasset Town Line



Northerly View of Atlantic Avenue and Straits Pond/Wetland A (East End of Straits Pond)  
Opposite Green Hill/Summit Avenue West of the Hull/Cohasset Town Line





Westerly View of Wetland C (Central Portion of Straits Pond) – Straits Pond on Left (South) and Atlantic Avenue and Residential Parking Area on Right (North)



Southerly View of Wetland C/Straits Pond (Central Portion) from Atlantic Ave. and Residential Parking Area - Sediment/Gravel Over-wash from Coastal Storms Creating Fill South of Atlantic Avenue





Southeasterly View of Wetland C (Central Portion of Straits Pond) – Straits Pond on Right (South) – Sediment/Gravel Over-wash from Coastal Storms Creating Fill in Straits Pond South of Atlantic Avenue



Northeasterly View of Wetland C from Straits Pond - Atlantic Avenue between Houses - Sediment/Gravel Over-wash from Coastal Storms Creating Fill on South Side of Atlantic Avenue





Westerly View of Atlantic Avenue and Straits Pond/Wetland D (Western End of Straits Pond)  
Opposite Basket Ball/Tennis Courts near Junction with Stoney Beach Road



Easterly View of Atlantic Avenue and Straits Pond/Wetland D (Western End of Straits Pond)  
Opposite Basket Ball/Tennis Courts near Junction with Stoney Beach Road

## **Appendix E**

### ***DEP Data Forms***

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# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Hull – DPW/MADOT Prepared by: CHA, Consulting, Inc. Project Location: Atlantic Avenue DEP File #: \_\_\_\_\_

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

**Section I. Vegetation** Observation Plot Number: Wetland A Transect Number: Series C – 6/5 Date of Delineation: 10/18/15

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
<u>Trees:</u> NA				
<u>Saplings:</u> NA				
<u>Shrubs:</u> NA				
<u>Herb:</u> seashore saltgrass ( <i>Distichlis spicata</i> )	93	93/103.5 =90%	yes	FACW*
marsh elder ( <i>Iva frutescens</i> )	10.5	10.5/103.5=10%	no	FACW+
<u>Vine:</u> NA				

\* Use an asterisk to mark indicator plants: plant species listed in the wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

**Vegetation conclusion:** Hydrophytic Plant Community

Number of dominant wetland indicator plants: 1

Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants: 100% yes ☒ no ☐

## Section II. Indicators of Hydrology

### Hydric Soil Interpretation

### Wetland Series A

#### 1. Soil Survey

Is there a published soil survey for this site? Yes ☒ no ☐

title/date: **Soil Survey of Plymouth County (2010) – USDA NRCS  
Web Soil Survey**

map number: **NA**

soil type mapped: **Canton-Urban land-Rock outcrop, Urban land-  
Hooksan complex, Paxton loam, and Canton-Chatfield-Rock outcrop**

hydric soil inclusions: **Oxyaquic Udipsamments**

Are field observations consistent with soil survey? Yes ☒ no ☐

Remarks:

#### 2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
C <sub>1</sub>	0– 16+”	10YR 5/2 (70%) 10YR 3/3(20%) 10YR 4/6 (10%)	coarse/fine sand

Remarks: **Occurs below MHW mark of Straits Pond**

#### 3. Other:

Conclusion: Is soil hydric? Yes ☒ No ☐

Other Indicators of Hydrology: (check all that apply and describe)

- ☒ Site inundated: plot adjacent to Straits Pond
- ☐ Depth to free water in observation hole: \_\_\_\_\_
- ☒ Depth to soil saturation in observation hole: surface
- ☒ Water marks: \_\_\_\_\_
- ☐ Drift lines: \_\_\_\_\_
- ☐ Sediment deposits: \_\_\_\_\_
- ☒ Drainage patterns in BVW: plot below MHW of Straits Pond
- ☐ Oxidized rhizospheres: \_\_\_\_\_
- ☐ Water-stained leaves: \_\_\_\_\_
- ☐ Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_
- ☐ Other: \_\_\_\_\_

### Vegetation and Hydrology Conclusion

	yes	no
Number of wetland indicator plants greater than or equal to number of non-wetland indicator plants	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Wetland hydrology present:		
hydric soil present	<input checked="" type="checkbox"/>	<input type="checkbox"/>
other indicators of hydrology present	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Sample location is in BVW</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

*Submit this form with the Request for Determination of Applicability or Notice of Intent.*

# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Hull – DPW/MADOT Prepared by: CHA, Consulting, Inc. Project Location: Atlantic Avenue DEP File #: \_\_\_\_\_

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

**Section I. Vegetation** Observation Plot Number: Upland A Transect Number: Series A – 5/6/ Date of Delineation: 10/18/15

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
<u>Trees:</u> N/A				
<u>Saplings:</u> Ailanthus ( <i>Ailanthus altissima</i> )	20.5	20.5/20.5= 100%	yes	FAC
<u>Shrubs:</u> Eastern red cedar ( <i>Juniperus virginiana</i> )	20.5	20.5/51.5= 40%	yes	FACU
Tartarian honeysuckle ( <i>Lonicera tatarica</i> )	20.5	20.5/51.5= 40%	yes	FACU
Ailanthus ( <i>Ailanthus altissima</i> )	10.5	10.5/51.5= 20%	yes	FAC
<u>Herb:</u> multiflora rose ( <i>Rosa multiflora</i> )	38	38/48= 80%	yes	FACU
yarrow ( <i>Achillea millefolium</i> )	3	3/48=6%	no	FACU
seaside goldenrod ( <i>Solidago sempervirens</i> )	3	3/48=6%	no	FACW*
staghorn sumac ( <i>Rhus typhina</i> )	3	3/48=6%	no	FACU
common mullein ( <i>Verbascum thapsus</i> )	1	1/48=2%	yes	NI-FACU
<u>Vine:</u> poison ivy ( <i>Toxicodendron radicans</i> )	3	3/3= 100%	no	FAC*

\* Use an asterisk to mark indicator plants: plant species listed in the wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

**Vegetation conclusion:** Upland Plant Community

Number of dominant wetland indicator plants: 2

Number of dominant non-wetland indicator plants: 3

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants: 40% yes ☐ no ☒

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

MA DEP; 3/95



## Section II. Indicators of Hydrology

### Hydric Soil Interpretation

### Upland Series A

#### 1. Soil Survey

Is there a published soil survey for this site? Yes ☒ no ☐

title/date: **Soil Survey of Plymouth County (2010) – USDA NRCS  
Web Soil Survey**

map number: **NA**

soil type mapped: **Canton-Urban land-Rock outcrop, Urban land-  
Hooksan complex, Paxton loam, and Canton-Chatfield-Rock outcrop**

hydric soil inclusions: **Oxyaquic Udipsamments**

Are field observations consistent with soil survey? Yes ☒ no ☐

Remarks:

#### 2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
C <sub>1</sub>	0– 16+”	10YR 3/3(50%) 10YR 5/2 (25%) 10YR 4/1 (25%)	loamy coarse/ fine sand

Remarks: **Plot occurs at edge of Atlantic Avenue – historic fill, occasional  
ocean overwash from Black Rock Beach**

#### 3. Other:

Conclusion: Is soil hydric? Yes ☐ No ☒

Other Indicators of Hydrology: (check all that apply and describe)

- ☐ Site inundated: \_\_\_\_\_
- ☐ Depth to free water in observation hole: \_\_\_\_\_
- ☐ Depth to soil saturation in observation hole: \_\_\_\_\_
- ☐ Water marks: \_\_\_\_\_
- ☐ Drift lines: \_\_\_\_\_
- ☒ Sediment deposits: \_\_\_\_\_
- ☐ Drainage patterns in BVW: \_\_\_\_\_
- ☐ Oxidized rhizospheres: \_\_\_\_\_
- ☐ Water-stained leaves: \_\_\_\_\_
- ☐ Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_

☐ Other: \_\_\_\_\_

### Vegetation and Hydrology Conclusion

	yes	no
Number of wetland indicator plants greater than or equal to number of non-wetland indicator plants	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Wetland hydrology present:		
hydric soil present	<input type="checkbox"/>	<input checked="" type="checkbox"/>
other indicators of hydrology present	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Sample location is in BVW</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

*Submit this form with the Request for Determination of Applicability or Notice of Intent.*

# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Hull – DPW/MADOT Prepared by: CHA, Consulting, Inc. Project Location: Atlantic Avenue DEP File #: \_\_\_\_\_

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

**Section I. Vegetation** Observation Plot Number: Wetland D Transect Number: Series D – 6/7 Date of Delineation: 10/18/15

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
<u>Trees:</u> NA				
<u>Saplings:</u> NA				
<u>Shrubs:</u> NA				
<u>Herb:</u> common reed ( <i>Phragmites australis</i> )	100	100/100= 100%	yes	FACW*
<u>Vine:</u> NA				

\* Use an asterisk to mark indicator plants: plant species listed in the wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

**Vegetation conclusion:** Hydrophytic Plant Community

Number of dominant wetland indicator plants: 1

Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants: 100% yes ☒ no ☐

# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Hull – DPW/MADOT Prepared by: CHA, Consulting, Inc. Project Location: Atlantic Avenue DEP File #: \_\_\_\_\_

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

**Section I. Vegetation** Observation Plot Number: Wetland B&C Transect Number: Series C – 6/5 Date of Delineation: 10/18/15

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
<u>Trees:</u> NA				
<u>Saplings:</u> NA				
<u>Shrubs:</u> NA				
<u>Herb:</u> saltmarsh cordgrass ( <i>Spartina alterniflora</i> )	63	63/107 = 59%	yes	OBL*
marsh elder ( <i>Iva frutescens</i> )	20.5	20.5/107=19%	no	FACW+
common reed ( <i>Phragmites australis</i> )	20.5	20.5/107= 19%	no	FACW*
seaside goldenrod ( <i>Solidago sempervirens</i> )	3	3/107 = 3%	no	FACW*
<u>Vine:</u> NA				

\* Use an asterisk to mark indicator plants: plant species listed in the wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

**Vegetation conclusion:** Hydrophytic Plant Community

Number of dominant wetland indicator plants: 1

Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants: 100% yes ☒ no ☐

## Section II. Indicators of Hydrology

### Hydric Soil Interpretation

### Wetland Series B&C

#### 1. Soil Survey

Is there a published soil survey for this site? Yes ☒ no ☐

title/date: **Soil Survey of Plymouth County (2010) – USDA NRCS  
Web Soil Survey**

map number: **NA**

soil type mapped: **Canton-Urban land-Rock outcrop, Urban land-  
Hooksan complex, Paxton loam, and Canton-Chatfield-Rock outcrop**

hydric soil inclusions: **Oxyaquic Udipsamments**

Are field observations consistent with soil survey? Yes ☒ no ☐

Remarks:

#### 2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
C <sub>1</sub>	0– 3"	10YR 4/3	coarse sand
A <sub>1</sub>	3– 6"	10YR 2/1	silty sand/ loam
A <sub>2</sub>	6– 18"	10YR 2/1	sandy silt
C <sub>2</sub>	18– 20+"	2.5YR 2/1	coarse sand

Remarks: Occurs below MHW mark of Straits Pond

#### 3. Other:

Conclusion: Is soil hydric? Yes ☒ No ☐

Other Indicators of Hydrology: (check all that apply and describe)

- ☒ Site inundated: **plot adjacent to Straits Pond**
- ☐ Depth to free water in observation hole: \_\_\_\_\_
- ☒ Depth to soil saturation in observation hole: **surface**
- ☒ Water marks: \_\_\_\_\_
- ☐ Drift lines: \_\_\_\_\_
- ☐ Sediment deposits: \_\_\_\_\_
- ☒ Drainage patterns in BVW: **plot below MHW of Straits Pond**
- ☐ Oxidized rhizospheres: \_\_\_\_\_
- ☐ Water-stained leaves: \_\_\_\_\_
- ☐ Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_

☒ Other: **sulphur smell**

### Vegetation and Hydrology Conclusion

	yes	no
Number of wetland indicator plants greater than or equal to number of non-wetland indicator plants	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Wetland hydrology present:		
hydric soil present	<input checked="" type="checkbox"/>	<input type="checkbox"/>
other indicators of hydrology present	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample location is in BVW	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Submit this form with the Request for Determination of Applicability or Notice of Intent.

# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Hull – DPW/MADOT Prepared by: CHA, Consulting, Inc. Project Location: Atlantic Avenue DEP File #: \_\_\_\_\_

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

**Section I. Vegetation** Observation Plot Number: Upland B&C Transect Number: Series C – 6/5 Date of Delineation: 10/18/15

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
<u>Trees:</u> N/A				
<u>Saplings:</u> N/A				
<u>Shrubs:</u> N/A				
<u>Herb:</u> common reed ( <i>Phragmites australis</i> )	83	83/103.5= 80%	yes	FACW*
seaside goldenrod ( <i>Solidago sempervirens</i> )	20.5	20.5/103.5 = 20%	yes	FACW*
<u>Vine:</u> NA				

\* Use an asterisk to mark indicator plants: plant species listed in the wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

**Vegetation conclusion:** Upland Plant Community

Number of dominant wetland indicator plants: 2

Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants: 100% yes ☒ no ☐

## Section II. Indicators of Hydrology

### Hydric Soil Interpretation

### Upland Series B&C

#### 1. Soil Survey

Is there a published soil survey for this site? Yes ☒ no ☐

title/date: **Soil Survey of Plymouth County (2010) – USDA NRCS  
Web Soil Survey**

map number: **NA**

soil type mapped: **Canton-Urban land-Rock outcrop, Urban land-  
Hooksan complex, Paxton loam, and Canton-Chatfield-Rock outcrop**

hydric soil inclusions: **Oxyaquic Udipsamments**

Are field observations consistent with soil survey? Yes ☒ no ☐

Remarks:

#### 2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
<b>C</b>	<b>0 – 12"</b>	<b>10 YR 4/3</b>	<b>coarse sand w/ gravel cobble</b>
<b>Refusal</b>			

Remarks: **Plot occurs at edge of parking area in gravel/overwash flood zone  
adjacent to wetland**

#### 3. Other:

Conclusion: Is soil hydric? Yes ☐ No ☒

Other Indicators of Hydrology: (check all that apply and describe)

- ☐ Site inundated: \_\_\_\_\_
- ☐ Depth to free water in observation hole: \_\_\_\_\_
- ☐ Depth to soil saturation in observation hole: \_\_\_\_\_
- ☐ Water marks: \_\_\_\_\_
- ☐ Drift lines: \_\_\_\_\_
- ☒ Sediment deposits: \_\_\_\_\_
- ☒ Drainage patterns in BVW: \_\_\_\_\_
- ☐ Oxidized rhizospheres: \_\_\_\_\_
- ☐ Water-stained leaves: \_\_\_\_\_
- ☐ Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_
- \_\_\_\_\_
- ☐ Other: \_\_\_\_\_

### Vegetation and Hydrology Conclusion

	yes	no
Number of wetland indicator plants greater than or equal to number of non-wetland indicator plants	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Wetland hydrology present:		
hydric soil present	<input type="checkbox"/>	<input checked="" type="checkbox"/>
other indicators of hydrology present	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Sample location is in BVW</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

*Submit this form with the Request for Determination of Applicability or Notice of Intent.*

## Section II. Indicators of Hydrology

### Hydric Soil Interpretation

### Wetland Series D

#### 1. Soil Survey

Is there a published soil survey for this site? Yes ☒ no ☐

title/date: **Soil Survey of Plymouth County (2010) – USDA NRCS  
Web Soil Survey**

map number: **NA**

soil type mapped: **Canton-Urban land-Rock outcrop, Urban land-  
Hooksan complex, Paxton loam, and Canton-Chatfield-Rock outcrop**

hydric soil inclusions: **Oxyaquic Udipsamments**

Are field observations consistent with soil survey? Yes ☒ no ☐

Remarks:

#### 2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
<b>O<sub>A</sub></b>	<b>0– 16"</b>	<b>10YR 2/1</b>	<b>OM</b>
<b>Refusal – cobble/gravel</b>			

Remarks: Plot occurs at edge of Straits Pond

#### 3. Other:

Conclusion: Is soil hydric? Yes ☒ No ☐

Other Indicators of Hydrology: (check all that apply and describe)

- ☒ Site inundated: **plot adjacent to Straits Pond**
- ☒ Depth to free water in observation hole: **8"**
- ☐ Depth to soil saturation in observation hole: \_\_\_\_\_
- ☒ Water marks: \_\_\_\_\_
- ☐ Drift lines: \_\_\_\_\_
- ☐ Sediment deposits: \_\_\_\_\_
- ☒ Drainage patterns in BVW: **plot below MHW of Straits Pond**
- ☐ Oxidized rhizospheres: \_\_\_\_\_
- ☒ Water-stained leaves: \_\_\_\_\_
- ☐ Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_

☒ Other: **sulphur smell**

### Vegetation and Hydrology Conclusion

	yes	no
Number of wetland indicator plants greater than or equal to number of non-wetland indicator plants	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Wetland hydrology present:		
hydric soil present	<input checked="" type="checkbox"/>	<input type="checkbox"/>
other indicators of hydrology present	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Sample location is in BVW</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

*Submit this form with the Request for Determination of Applicability or Notice of Intent.*

# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Hull – DPW/MADOT Prepared by: CHA, Consulting, Inc. Project Location: Atlantic Avenue DEP File #: \_\_\_\_\_

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

**Section I. Vegetation** Observation Plot Number: Upland D Transect Number: Series D – 6/7 Date of Delineation: 10/18/15

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
<u>Trees:</u> N/A				
<u>Saplings:</u> N/A				
<u>Shrubs:</u> rugosa rose ( <i>Rosa rugosa</i> )	38	38/38= 100%	yes	FACU
<u>Herb:</u> Kentucky bluegrass ( <i>Poa pratensis</i> )	20.5	20.5/26.5= 78%	yes	FACU
broad-leaved plantain ( <i>Plantago major</i> )	3	3/26.5= 11%	no	FACU
common reed ( <i>Phragmites australis</i> )	3	3/26.5= 11%	no	FACW*
<u>Vine:</u> Oriental bittersweet ( <i>Celastrus orbiculatus</i> )	20.5	20.5/31= 66%	yes	FACU
poison ivy ( <i>Toxicodendron radicans</i> )	10.5	10.5/31= 34%	yes	FAC*

\* Use an asterisk to mark indicator plants: plant species listed in the wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

**Vegetation conclusion:** Upland Plant Community

Number of dominant wetland indicator plants: 1

Number of dominant non-wetland indicator plants: 3

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants: 25% yes ☐ no ☒

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

MA DEP; 3/95



## Section II. Indicators of Hydrology

### Hydric Soil Interpretation

### Upland Series D

#### 1. Soil Survey

Is there a published soil survey for this site? Yes ☒ no ☐

title/date: **Soil Survey of Plymouth County (2010) – USDA NRCS  
Web Soil Survey**

map number: **NA**

soil type mapped: **Canton-Urban land-Rock outcrop, Urban land-  
Hooksan complex, Paxton loam, and Canton-Chatfield-Rock outcrop**

hydric soil inclusions: **Oxyaquic Udipsamments**

Are field observations consistent with soil survey? Yes ☒ no ☐

Remarks:

#### 2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
<b>O<sub>1</sub></b>	<b>2 – 0"</b>	<b>10 YR 3/1</b>	<b>OM</b>
<b>A<sub>1</sub></b>	<b>0 – 12"</b>	<b>10 YR 3/2</b>	<b>loam</b>
<b>A<sub>2</sub></b>	<b>12 – 14"</b>	<b>10 YR 4/6</b>	<b>loam</b>
<b>Refusal - gravel</b>			

Remarks: **Plot occurred at disturbed road edge**

#### 3. Other:

Conclusion: Is soil hydric? Yes ☐ No ☒

Other Indicators of Hydrology: (check all that apply and describe)

☐ Site inundated: \_\_\_\_\_

☐ Depth to free water in observation hole: \_\_\_\_\_

☐ Depth to soil saturation in observation hole: \_\_\_\_\_

☐ Water marks: \_\_\_\_\_

☐ Drift lines: \_\_\_\_\_

☐ Sediment deposits: \_\_\_\_\_

☐ Drainage patterns in BVW: \_\_\_\_\_

☐ Oxidized rhizospheres: \_\_\_\_\_

☐ Water-stained leaves: \_\_\_\_\_

☐ Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_

☐ Other: \_\_\_\_\_

### Vegetation and Hydrology Conclusion

	yes	no
Number of wetland indicator plants greater than or equal to number of non-wetland indicator plants	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Wetland hydrology present:		
hydric soil present	<input type="checkbox"/>	<input checked="" type="checkbox"/>
other indicators of hydrology present	<input type="checkbox"/>	<input checked="" type="checkbox"/>

<b>Sample location is in BVW</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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Submit this form with the Request for Determination of Applicability or Notice of Intent.

## **Appendix F**

### ***Wetland Replication & Restoration Plan***

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## **WETLAND REPLICATION & RESTORATION PLAN**

The intent of the proposed Wetland Replication & Restoration Plan (WR&RP) along Straits Pond at approximate Sta. 33+00 is to provide for the functional replacement/restoration of salt marsh and bordering vegetated wetland (BVW) altered during the proposed Atlantic Avenue roadway improvements. The project proposes to create/replicate low marsh in an existing high marsh/BVW area and restore/replicate BVW as mitigation for the project as discussed below. The high marsh, BVW and adjacent buffer zone areas are infested with phragmites. In addition, the area has been historically filled with sand, gravel and cobble from overwash/storms from Massachusetts Bay, and the site is heavily disturbed and exhibits poor function. However, a seawall along Massachusetts Bay north of Atlantic Avenue has been raised by 2 feet in recent years, and with the proposed storm water/road improvements for Atlantic Avenue, the replication/restoration of the salt marsh and BVW will improve resource area function of this area. Eradication/management of the phragmites was considered in the design and will be instrumental for the successful restoration of this area.

Approximately 264 square feet (s.f.) of salt marsh and 617 s.f. of BVW are proposed to be impacted as discussed below associated with wetland replication/restoration, slope work and stormwater management/erosion protection as identified on Project Plans (See Section 5) along Atlantic Avenue. Approximately 327 s.f. of salt marsh replication/restoration (227 s.f. low marsh ( $\leq 2.8$  feet (MHW – NAVD 88)) and 100 s.f. high marsh ( $> 2.8$  feet and  $< 3.2$  feet)) are proposed. Another 319 s.f. of BVW are also proposed to be replicated. Due to its position on the landscape and elevation requirements at/below MHW, the low marsh replication area is proposed to be sited on existing high marsh (218 s.f.) and BVW (109 s.f.) wetland areas, and access is also required through these wetland habitats. Following grading and revegetation of the low marsh, the high marsh (100 s.f.) and BVW (315 s.f.) temporarily altered will be restored and/or replicated. It should be noted that of the total 617 s.f. of BVW proposed to be impacted for the project, approximately 109 s.f. is located within the newly proposed, replicated salt marsh (below 3.2 feet elevation), and additional BVW replication area, approximately 319 s.f., has been incorporated into the project design accordingly. The replicated BVW is proposed on upland areas adjacent to existing salt marsh/BVW within the 100-foot buffer zone. Restoration of 2,080 s.f. of the 100-foot buffer zone associated with improvements to the stormwater control outlet and parking area reconfiguration is proposed adjacent to the salt marsh and BVW replication areas in this vicinity.

### **Salt Marsh/BVW/Buffer Zone Restoration and/or Replication Overview**

The primary characteristic necessary to ensure the success of the Salt Marsh Replication and Restoration Area (SMR&RA) is the presence of hydrology adequate to support hydrophytic vegetation and to establish hydric soils. The SMR&RA will be located adjacent to existing wetland resource areas above/below the mean high water (MHW) line up to the high tide line (HTL) and topography of the site has been designed to match adjacent existing features. To ensure that adequate hydrology will be available, soil tests may be taken to determine seasonal groundwater levels (by mottles and other soil characteristics). If a change in the location of the SMR&RA is necessary, the applicant will seek approval from the Project Engineer and Hull Conservation Commission prior to implementing any changes.

Approximately 12 inches of clean, sand material will be installed throughout the SMR&RA, the BVW and upland buffer zone restoration areas. If there is insufficient usable soil from proposed fill/excavation areas on the project, additional soils will be imported for use at the replication site. Imported soils will be inspected and approved by a qualified Wetland Specialist before application. However, due to the presence of common reed (*Phragmites australis*) that dominates some areas of buffer zone, BVW and/or salt marsh along Atlantic Avenue, no material excavated from the wetland and adjacent upland buffer areas may be used for the proposed replication/restoration areas. A discussion of invasive, noxious and/or weedy species management and control measures is provided in the final section of this plan.

The SMR&RA will be revegetated with indigenous salt marsh species. The presence of various saltmarsh (*Spartina* spp.) communities and other coastal species observed along Straits Pond, as well as the improvement of active tidal cycles associated with the repair of the tidal gate under Nantasket Avenue/Route 228 (2012), suggest suitable conditions for redevelopment of indigenous salt marsh communities present in the area. The SMR&RA will occur above/below the MHW line up to the HTL, and species composition and abundance (See Table 1 below) have been selected for proposed site conditions. Smooth cordgrass (*Spartina alterniflora*), saltmeadow cordgrass (*Spartina patens*), seashore saltgrass (*Distichlis spicata*) and saltmeadow rush (*Juncus gerardii*) will be planted in the zone at/adjacent to MHW. Marsh elder/high-tide bush (*Iva frutescens*) will be planted at the upper limits of MHW up to the HTL at the salt marsh/BVW transition zone.

As identified in the BVW Replication and Restoration Area Construction Sequence below, switchgrass (*Panicum virgatum*), a salt tolerant grass species, and seaside goldenrod (*Solidago sempervirens*) are proposed to be planted adjacent to the SMR&RA. The Buffer Zone Restoration Construction Sequence, also identified below, also includes switchgrass and seaside goldenrod as well as shrubs, such as Virginia rose (*Rosa virginia*), Northern bayberry (*Morella pensylvanica*) and beach plum (*Prunus maritima*), that will be planted between the BVW replication area and Atlantic Avenue. A conservation seed mix/coastal salt tolerant grass mix is proposed to be used for side slopes and roadside slopes.

A botanist, ecologist, wetland scientist, or other individual with similar qualifications, thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (WPA) (MGL C. 131, s.40) and all other relevant regulations of the DEP and as described in the MassDOT special provision (Item 755.75), will be present on-site to oversee the replication process. This individual, herein after referred to as "Wetland Specialist", shall be approved by the Project Engineer and Hull Conservation Commission.

### **Salt Marsh Replication and Restoration Construction Sequence**

The Contractor shall plan and execute operations in a manner minimizing the amount of erosion and disturbance during excavation of the wetland/upland areas for replication and restoration of the SMR&RA along the banks of Straits Pond. Work at the edge of existing wetlands will be coordinated to occur during periods when tides are below the work zone to reduce sedimentation to Straits Pond. The area will be contoured to create the minimum gradient possible given the rise over run of the wetland replication site and adjacent restoration/replication areas.

Species spacing/seeding densities have been adjusted above recommended levels to promote vegetative growth and to prevent the colonization by common reed from adjacent areas. As mentioned previously, a discussion of invasive, noxious and/or weedy species management and control measures is provided in the final section of this plan. Table 1 represents the composition and abundance of species to be planted within the proposed SMR&RA.

<b>Table 1. – Salt Marsh Replication (227 S.F.) and Restoration (100 S.F.) Area</b>						
<b>Symbol</b>	<b>Quantity</b>	<b>Common Name</b>	<b>Botanical Name</b>	<b>Size</b>	<b>Spacing<sup>1</sup></b>	<b>Planting Area<sup>1</sup></b>
SPAL	250	smooth cordgrass <sup>2</sup>	<i>Spartina alterniflora</i>	2" peat pot	12" O.C.	227 S.F.
SPPA	35	saltmeadow cordgrass <sup>3</sup>	<i>Spartina patens</i>	2" peat pot	12" O.C.	34 S.F.
DISP	35	seashore saltgrass <sup>3</sup>	<i>Distichlis spicata</i>	2" peat pot	12" O.C.	33 S.F.
JUGE	35	saltmeadow rush <sup>3</sup>	<i>Juncus gerardii</i>	2" peat pot	12" O.C.	33 S.F.
IVFR	15	Marsh elder <sup>4</sup>	<i>Iva frutescens</i>	12-18"; #1 C.G.	3' O.C.	25 L.F. Zone

<sup>1</sup> On-center (O.C.); square feet (S.F.); linear feet (L.F.)

<sup>2</sup> Individuals should be planted between 2.2' – 2.8' elevation

<sup>3</sup> Individuals should be inter-planted alternately between 2.8' – 3.2' elevation

<sup>4</sup> Individuals should be planted along SMR&R rack line at 2.8'- 3.2' elevation

The following section describes the sequence of construction activities and provides information regarding grading and planting in the SMR&RA. It also contains temporary and permanent erosion and sedimentation control (ESC) measures that will be utilized during the various phases of construction.

### ***Erosion and Sedimentation Controls***

Prior to the commencement of construction activities, erosion and sedimentation control (ESC) measures will be installed along the boundaries of existing resource areas abutting the proposed SMR&RA (See Section 5, Wetland Replication Area Plan). In addition, upon completion of planting the SMR&RA, additional ESC measures may be placed at the toe of slopes/BVW boundary, as necessary, to prevent sedimentation from adjacent areas. Erosion controls will be inspected throughout construction and maintained as required to prevent sediment from entering adjacent wetland areas and will remain in place until the replication area is fully vegetated and stabilized.

Silt fence, burlap sandbags, mulch filter tubes (above 4.0 feet elevation) or an equivalent shall be installed along the boundary of the active work areas (limits of work) along wetland resources bordering Straits Pond to reduce sedimentation to the pond/existing wetlands. Mulch filter tubes shall be secured with 1" x 1" x 3' stakes, or per design specifications, spaced evenly and driven solidly into the underlying material. The ESC measures shall serve as the limit of work line and will protect the replication/restoration areas from erosion and from foreign materials which could potentially enter the areas.

A silt boom or equivalent structure may be installed in Straits Pond in the vicinity of the SMR&RA as necessary to reduce turbidity to the pond. The boom or equivalent structure will remain in place throughout construction activities and removed once stabilization is complete. Accumulation of sediment at the base of the boom will be removed with a hand shovel during low tides if channel bottom substrates are firm enough to walk across without causing further disruption/sedimentation to the intertidal zone.

### ***Clearing***

The proposed replication area will be cleared of existing vegetation, predominantly herbaceous species including common reed. Common reed is a noxious/invasive species and may germinate from seed, rhizomes and/or stems, and care must be taken to ensure that all plant material cleared from the area is bagged and removed and disposed of in a suitable waste facility.

### ***Rough Grading***

Rough grades for the proposed SMR&RA will be established at approximately 12 inches below desired final grade/elevation of existing adjacent wetland resource areas to accommodate surface organic layers. The final elevation of replicated areas will be determined according to the Wetland Restoration Site Plan and/or modified in the field by a qualified Wetland Specialist in order to successfully create suitable hydrologic conditions to support hydrophytic species. Upland side slopes will be graded at 3:1 slopes and/or blended into existing uplands and/or roadside slopes per construction requirements. All materials removed from the proposed replication area are presumed to be infested with common reed and should be removed from the project area and disposed of in a suitable waste facility to avoid contamination of other areas on or outside of the project limits. If common reed roots are observed below 12 inches, areas should be over-excavated to remove all visible roots per the Wetland Specialist or Project Engineer recommendations. Areas excavated below 12 inches may be backfilled with a sand mix and/or material of similar composition to that observed during excavation.



### ***Soil Installation***

For salt marsh replication areas, approximately 12 inches of clean, sand material will be installed throughout the SMR&RA. Usable sand with minimal organic matter and/or no invasive species plant material may be stripped and stockpiled from proposed fill/excavation areas on the project. Sand excavated from the intertidal zone may be saline. Saline soils shall not be used in landscape areas outside intertidal wetlands of similar salinity. Imported soils for planting shall be clean, sand conforming to the requirements of M1.04.0 Type 'a' Sand Borrow per the Massachusetts Department of Transportation (MassDOT) Division III of the Standard Specifications or an equivalent. Compost or organic soil amendments shall not be used within tidal wetland replication areas to limit colonization of common reed.

### ***Planting***

All plant material used shall be nursery-grown, healthy, have a well-developed root systems, and be free of disease, insect pests, eggs or larvae. Plant material shall be planted as soon as possible (within a week) after it has been purchased. If it arrives at the site more than 12 hours before it is planted, it shall be maintained by careful watering (brackish/saline solution - may be obtained from Straits Pond). Wetland plantings will be installed using hand implements, e.g., shovel, trowel or planting bars, under the supervision of a Wetland Specialist.

Container-grown plants/peat pots shall have sufficient roots to hold planting mix intact after removal from containers but should not be root bound. Plants shall be positioned in the area as shown on plans and placed in staggered rows. Spacings shall be determined under the direction and guidance of a qualified Wetland Specialist. To install each container plant, a small hole shall be dug by hand using spades, dibbles, or planting bars. The plant shall be removed from its container and set in the hole in a manner so that the top of the "root ball" is level with the surface of the ground. Care will be taken to avoid damage to the roots during handling. A small portion of slow-release fertilizer, approved by the Wetland Specialist, may be placed in the hole prior to the input of the "root ball". Fertilizer that is high in phosphorus composition will aid in plant root development, and care shall be taken not to over-fertilize the transplanted plant material. If, by the determination of the Wetland Specialist, some plants are burned due to over-application of the fertilizer, all affected plant material must be replaced in kind.

### ***Irrigation***

Saltmarsh vegetation will be watered with a saline/brackish solution on the same day of planting. Depending on site conditions, the restoration area will be irrigated with an approved water source (may be obtained from Straits Pond), if natural hydrological cycles do not provide sufficient water to sustain the newly planted vegetation.

### ***Monitoring***

Monitoring of the replication areas will be performed by a Wetland Specialist approved by the Project Engineer and Hull Conservation Commission. Monitoring reports will be prepared and submitted to the Commission/permitting agency upon the completion of planting and following the first and second growing seasons. The reports will describe the work completed, development of soils, hydrology and vegetation within restored/replicated sites as well as any action to be taken to repair, restore, or replant the restoration/replication areas if needed. Following annual inspections, the contractor will replace all plants that have not become established and re-seed areas that have not reached the desired 75 % cover after the first growing season.

## **BVW Replication & Restoration Area Construction Sequence**

Switchgrass (*Panicum virgatum*) and seaside goldenrod (*Solidago sempervirens*) are proposed to be planted within the BVW Restoration and Replication Area (BVW R&RA) adjacent to the SMR&RA. Species spacing/seeding densities have been adjusted above recommended levels to promote vegetative growth and to prevent the colonization by common reed from adjacent areas. Table 2 represents the composition and abundance of species to be planted within the proposed restoration/replication site.

<b>Table 2. –BVW Restoration (315 S.F.) and Replication (319 S.F.) Area</b>						
<b>Symbol</b>	<b>Quantity</b>	<b>Common Name</b>	<b>Botanical Name</b>	<b>Size</b>	<b>Spacing<sup>1</sup></b>	<b>Planting Area<sup>1</sup></b>
PAVI	35	switchgrass <sup>2</sup>	<i>Panicum virgatum</i>	#1 C.G.	3' O.C.	634 S.F.
SOSE	35	seaside goldenrod <sup>2</sup>	<i>Solidago sempervirens</i>	#1 C.G.	3' O.C.	634 S.F.

<sup>1</sup> On-center (O.C.); square feet (S.F.); linear feet (L.F.)

<sup>2</sup> Individuals should be inter-planted alternately between 3.2' – 3.6' elevation

The following section describes the sequence of construction activities and provides information regarding grading, planting and seeding in the BVW R&RA. It also contains temporary and permanent erosion and sedimentation control (ESC) measures that will be utilized during the various phases of construction.

The Contractor shall plan and execute operations in a manner minimizing the amount of erosion and disturbance during excavation of the upland/wetland areas for BVW restoration/replication along the banks of Straits Pond. Work at the edge of existing wetlands will be coordinated to occur during periods when tides are below the work zone to reduce sedimentation to Straits Pond. The area will be contoured to create the minimum gradient possible given the rise over run of the wetland replication site and adjacent sidewalk and guardrail adjacent to Atlantic Avenue.

### ***Erosion and Sedimentation Controls***

Prior to the commencement of construction activities, erosion and sedimentation control (ESC) measures will be installed along the boundaries of existing resource areas abutting the proposed SMR&RA. In addition, upon completion of planting the SMR&RA, additional ESC measures may be placed at the toe of side slopes/ SMR&RA-BVW boundary, as necessary, to prevent sedimentation from uplands areas. Erosion controls will be inspected throughout construction and maintained as required to prevent sediment from entering adjacent wetland areas and will remain in place until the replication area is fully vegetated and stabilized.

Silt fence, burlap sandbags, mulch filter tubes (above 4.0 feet elevation), or an equivalent shall be installed along the boundary of the active work areas (limits of work) adjacent to the MHW line and along any wetland resources bordering Straits Pond to reduce sedimentation to the pond and existing wetlands. Mulch filter tubes shall be secured with 1" x 1" x 3' stakes, or per design specifications, spaced evenly and driven solidly into the underlying material. The ESC measures shall serve as the limit of work line and will protect the replacement area from erosion and from foreign materials which could potentially enter the area.

### ***Clearing***

The proposed restoration/replication area will be cleared of existing vegetation, predominantly herbaceous species including common reed. Common reed is a noxious/invasive species and may germinate from seed, rhizomes and/or stems, and care must be taken to ensure that all plant material cleared from the area is bagged and removed and disposed of in a suitable waste facility.

### ***Rough Grading***

Rough grades for the proposed BVW R&RA will be established at approximately 12 inches below desired final grade/elevation of existing adjacent wetland resource areas to accommodate surface organic layers. The final elevation of replicated areas will be determined in the field by a qualified Wetland Specialist in order to successfully create suitable hydrologic conditions to support hydrophytic species. Upland side slopes will be graded at 3:1 slopes and/or blended into existing uplands and/or roadside slopes per construction requirements. All materials removed from the proposed replication area are presumed to be infested with common reed and should be removed from the project area and disposed of in a suitable waste facility to avoid contamination of other areas on or outside of the project limits. If common reed roots are observed below 12 inches, areas should be over-excavated to remove all visible roots. Areas excavated below 12 inches can be backfilled with a loamy sand mix and/or material of similar composition to that observed during excavation.

### ***Soil Installation***

For the BVW R&RA, approximately 12 inches of clean, sand material will be utilized to create suitable soil layers as needed to establish final grades with approximately 12 inches of soil material at the surface. The soil will be inspected and approved by a qualified Wetland Specialist before application. Imported soils will be blended with adjacent areas to create elevations as identified on site plans (See Section V). Imported soils for planting shall be clean, sand conforming to the requirements of M1.04.0 Type 'a' Sand Borrow per MassDOT Division III of the Standard Specifications or an equivalent. Compost or organic soil amendments shall not be used within wetland replication areas.

### ***Planting***

Container-grown/peat pot plants, including switchgrass and seaside goldenrod, shall have sufficient roots to hold planting mix intact after removal from containers, but should not be root bound. Plants shall be positioned in the area per spacing dimensions and/or as shown on plans and placed in staggered rows. Spacings shall be determined under the direction and guidance of a qualified Wetland Specialist. To install each container plant, a small hole shall be dug. The plant shall be removed from its container and set in the hole in a manner so that the top of the "root ball" is level with the surface of the ground. Care will be taken to avoid damage to the roots during handling. A small portion of slow-release fertilizer, approved by the Wetland Specialist, must be placed in the hole prior to the input of the "root ball". Fertilizer that is high in phosphorus composition will aid in plant root development, and care shall be taken not to over-fertilize the transplanted plant material. If, by the determination of the Wetland Specialist, some plants are burned due to over-application of the fertilizer, all affected plant material must be replaced in kind. No fertilizer shall be placed in the hole of bare-root material at the time of planting.

### ***Irrigation***

All vegetation within the BVW R&RA will be watered on the same day as planting with fresh water. If necessary, the restoration area will be irrigated with an approved water source if natural hydrological cycles do not provide sufficient water to sustain the newly planted vegetation.

### ***Monitoring***

Monitoring of the replication areas will be performed by a Wetland Specialist approved by the Project Engineer and Hull Conservation Commission. Monitoring reports will be prepared and submitted to the Commission upon the completion of planting and following the first and second growing seasons. The reports will describe the work completed, development of soils, hydrology and vegetation within replicated

sites as well as any action to be taken to repair, restore, or replant the replication areas if needed. Following annual inspections, the contractor will replace all plants that have not become established and re-seed areas that have not reached the desired 75 % cover after the first growing season.

### **Buffer Zone Restoration Area Construction Sequence**

The Buffer Zone Restoration Area (BZRA) identified below includes switchgrass and seaside goldenrod as well as shrubs, Virginia rose (*Rosa virginia*), Northern bayberry (*Morella pensylvanica*) and beach plum (*Prunus maritima*). These species will be planted adjacent to the BVW replication area up to Atlantic Avenue, and a conservation seed mix/coastal salt tolerant grass mix is proposed to be used for the roadside slopes and disturbed areas. Species spacing/seeding densities have been adjusted above recommended levels to promote vegetative growth and to prevent the colonization by common reed from adjacent areas. Table #3 represents the composition and abundance of species to be planted within the proposed restoration site.

<b>Table 3. –Buffer Zone Restoration Area (2,080 S.F.)</b>						
<b>Symbol</b>	<b>Quantity</b>	<b>Common Name</b>	<b>Botanical Name</b>	<b>Size</b>	<b>Spacing<sup>1, 2</sup></b>	<b>Planting Area<sup>1</sup></b>
ROVI	108	Virginia rose	<i>Rosa virginia</i>	12-18"; #1 C.G.	3' O.C.	980 S.F.
MOPE	10	Northern bayberry	<i>Morella pensylvanica</i>	12-18"; #1 C.G.	As shown/ 5' O.C.	250 S.F.
PRMA	27	beach plum	<i>Prunus maritima</i>	3-6"; #3 C.G.	As shown/ 5' O.C.	675 S.F.
PAVI	10	switchgrass	<i>Panicum virgatum</i>	#1 C.G.	3' O.C.	180 S.F.
SOSE	10	seaside goldenrod	<i>Solidago sempervirens</i>	#1 C.G.	3' O.C.	180 S.F.
Seed	2 lbs	N.E. Coastal Salt Tolerant Grass Mix	Various Species	1 lb / 1,250 sf	2lbs	2,080 S.F.

<sup>1</sup> On-center (O.C.); square feet (S.F.); linear feet (L.F.)

<sup>2</sup> Location/spacing shown on site plans

<sup>3</sup> Individuals should be inter-planted alternately between 3.6' – 5.0+' elevation

This section describes construction activities for the approximately 2,080 s.f. 100-foot buffer zone to be restored adjacent to the proposed BVW R&RA as identified on Project Plans (See Section 5). Erosion and sediment control (ESC) measure installation, site clearing, rough grading and soil installation phases as well as planting container-grown root stock will be consistent with the sequence for the BVW R&RA as provided above. The wetland restoration/replication area will be seeded with a conservation seed mix/coastal salt tolerant erosion control grass mix at an application rate of 1 pound per 1,250 square feet and will be used for the side slopes of the replication areas and any other disturbed areas for stabilization and re-vegetation. Late spring and summer seeding will benefit with a light mulching of clean, weed-free straw to conserve soil moisture. If conditions are drier than usual, watering may be required. Upon completion of seeding, additional erosion controls will be placed at the toe of side slopes as necessary to prevent sedimentation into resource areas. Upon completion of seeding, additional erosion controls will be placed at the buffer/BVW boundary as necessary to prevent sedimentation into resource areas. Site monitoring and invasive species management/control will be performed concurrently with the BVW R&RA and SMR&RA.

### **Invasive Species Management/Control**

Invasive species management and control may require one or a combination of methods for eradication and can include physical removal, smothering, chemical control or biological control and should be conducted according to the MassDOT Special Provisions Control of Invasive Plants Existing on Site (Item 102.3) and Invasive Plant Management Strategy (Item 102.33). The specific invasive species identified on site, and the area of coverage, will determine which removal efforts will be most effective. Common reed (*Phragmites australis*) is classified as an invasive/noxious species and occurs and within the high marsh/salt marsh, BVW and buffer zone. Physical eradication of common reed within these areas may occur during the initial

clearing and grading phases of restoration/replication. However, common reed may require eradication through herbicide applications in adjacent areas as well as discussed below dependent on site conditions.

### ***Manual/Mechanical Removal***

Digging/grubbing is effective for small, immature plants of invasive, noxious and/or weedy species such as common reed, purple loosestrife, multiflora rose and/or Tartarian honeysuckle, especially those rooted in loose soil, such that entire root systems may be removed to prevent re-sprouting. Excessive soil disturbance should be avoided to reduce creation of bare areas and minimize future colonization. Native vegetation should be left in place to the greatest extent possible to encourage expansion of existing populations. For herbaceous species such as common reed and purple loosestrife, plants should be removed prior to the onset of seed production (mid-summer) and seed heads should be cut and bagged to avoid further spread. All plant parts should be bagged, removed and placed in proper containers for disposal. Mature herbaceous and woody plants are generally too large for grubbing and are difficult to remove; therefore, these plants should be eradicated through a combination of clipping/cutting and/or herbicide application with a backpack-type sprayer or through foliar spot applications.

### ***Herbicide Application***

Herbicide application is the most effective, efficient and least destructive means of removing invasive, noxious and/or weedy species such as common reed, purple loosestrife, multiflora rose and/or Tartarian honeysuckle. Before any herbicide application is used, the Project Engineer and Hull Conservation Commission will be notified of the proposed use for review and approval.

Glyphosate is the most common compound used for eradicating common reed and purple loosestrife and other invasive species and comes in two forms: (1) "Roundup" for use on dry sites (to the edge if water); and (2) "Rodeo" for use on wet or standing water sites. Glyphosate applied with a backpack-type sprayer from late July through September has been recognized to be effective in eradication of invasive species (Wisconsin Department of Natural Resources). Herbicides can be sprayed onto foliage in a one percent solution. However, glyphosate is a nonselective herbicide, and will kill any green foliage that it comes in contact with. Care should be taken to avoid treating non-target plants. Herbicide applications can be applied directly to vegetation during the leaf-out period in the spring and summer by hand and "swiping" the vegetation from bottom to top with approved gloves saturated with an appropriate herbicide. For fall applications, herbicides can be applied directly to the cut stem/stump following clearing using a foam brush/paint brush to allow the herbicide to be absorbed into the plant's root system and kill the plant. These two methods represent targeted applications and avoid the need to spray and any associated overspray damage to indigenous/desirable species. However, "swiping" and/or cutting and painting/spot applications are labor intensive and can be expensive. Due to the limited size of the area and low number of herbicide applications anticipated, impacts to local wildlife and benthic organisms in Straits Pond should not be affected.

"Garlon 3A" is a broadleaf (dicot) specific herbicide recently found to be effective on purple loosestrife and other invasive species as well. Its advantage over glyphosate is that it doesn't harm monocots such as grasses, sedges, cattails, rushes, reeds, etc. Aquatic labeled 2-4, D has similar advantages to Garlon 3A and both are labeled for over water use and may be an alternative to Rodeo.

### ***Monitoring***

The Wetland Specialist shall conduct follow-up inspections of the salt marsh, BVW and buffer zone restoration/replication areas after the first and second growing seasons to determine the success of re-vegetation and noxious species eradication. If excessive noxious and/or invasive species germinate/re-grow,



a professional agronomist or other certified professional may need to be consulted to determine the need for additional eradication and/or restoration measures. Other invasive/noxious species such as purple loosestrife, as well as weedy species such as multiflora rose (*Rosa multiflora*), European buckthorn (*Rhamnus frangula*) and Tartarian honeysuckle (*Lonicera tatarica*), have been documented along Straits Pond and clearing and herbicide applications may be necessary to control these species as well.

## Appendix G

### ***NRCS Soil Information***

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# Soil Map—Norfolk and Suffolk Counties, Massachusetts, and Plymouth County, Massachusetts




**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

10/10/2015  
Page 1 of 3

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:12,000 to 1:25,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts  
Survey Area Data: Version 10, Sep 19, 2014

Soil Survey Area: Plymouth County, Massachusetts  
Survey Area Data: Version 7, Sep 19, 2014

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—Sep 4, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Norfolk and Suffolk Counties, Massachusetts (MA616)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
105D	Rock outcrop-Hollis complex, 3 to 25 percent slopes	0.1	0.8%
610	Beaches	0.1	0.9%
<b>Subtotals for Soil Survey Area</b>		<b>0.3</b>	<b>1.8%</b>
<b>Totals for Area of Interest</b>		<b>14.8</b>	<b>100.0%</b>

Plymouth County, Massachusetts (MA023)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
110C	Canton - Chatfield - Rock outcrop complex, 8 to 15 percent slopes	0.0	0.1%
110E	Canton - Chatfield - Rock outcrop complex, 15 to 35 percent slopes	1.0	6.5%
306E	Paxton loam, 15 to 35 percent slopes, very stony	2.3	15.8%
607	Water, saline	0.2	1.4%
610	Beaches, sandy	0.2	1.1%
614A	Oxyaquic Udipsamments, 0 to 3 percent slopes	0.7	4.6%
635C	Canton - Urban land - Rock outcrop complex, 3 to 15 percent slopes	6.9	46.9%
639B	Urban land - Hooksan complex, 0 to 8 percent slopes	3.2	21.9%
<b>Subtotals for Soil Survey Area</b>		<b>14.5</b>	<b>98.2%</b>
<b>Totals for Area of Interest</b>		<b>14.8</b>	<b>100.0%</b>



## Appendix H

### *MHW & MLW Supporting Documentation*

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# **STRAITS POND TIDE GATE OPERATION AND MAINTENANCE PLAN**



**TOWN OF HULL, MASSACHUSETTS**  
DEPARTMENT OF PUBLIC WORKS

WEST CORNER CULVERT  
ROUTE 228 OVER STRAITS CHANNEL  
HULL, COHASSET, AND HINGHAM, MASSACHUSETTS



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December 5, 2007

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## **ATTACHMENTS**

**ATTACHMENT A: INSPECTION AND PREVENTATIVE MAINTENANCE CHECKLIST**

**ATTACHMENT B: ADJUSTMENT LOG**



## INTRODUCTION

This Tide Gate Operation and Maintenance (O&M) Plan, prepared for the West Corner Culvert Replacement/Straits Pond Habitat Restoration Project, addresses the procedures, protocols and evaluation methods that will be applied to the inspection, operation and override of the tide gates that control tidal exchange and the water level within Straits Pond. This O&M Plan should be periodically reviewed and modified to reflect operational and environmental changes related to the project. This manual was prepared by The Louis Berger Group, Inc. as a provision of the 401 Water Quality Certification, MA CZM Federal Consistency Concurrence, and the US Army Corps of Engineers permit and approval for the Massachusetts Highway Department reconstruction of the West Corner Culvert Replacement Bridge No. C-17-004 Route 228 Over Straits Channel Hull-Cohasset-Hingham and will serve as an enforceable mechanism for the operation of the associated tide gates. The Town of Hull Department of Public Works (DPW) is the responsible party overseeing construction and future operation of the West Corner tide gates. By adhering to the procedures set forth in this plan, involved parties can ensure the application of a consistent approach to tide gate operation and maintenance.

## BACKGROUND

The Bridge Replacement of Route 228 (Nantasket Avenue) over Straits Channel is located in the Towns of Hull, Cohasset, and Hingham. See Locus Map. The West Corner Bridge is at the junction of these three Towns. Straits Channel connects to Straits Pond, which is a shallow coastal pond over 90 acres in size, located in the southeasterly area of Hull and northwestern area of Cohasset. Straits Pond forms the boundary between Hull and Cohasset. The Bridge is approximately 250 feet north of the Route 228/Rockland Street/Jerusalem Road intersection.

The existing West Corner Bridge (Route 228) consists of a 12-foot span, 8-1/2 foot rise culvert with stone masonry walls. The upstream or east side of the structure includes twin manually operated slide gates (one of which is 4x4 feet and the other is 5x5 feet). The combined structure provides flood protection to low-lying properties along Straits Pond. However, the current structure is too small to provide effective tidal exchange within the Pond, which has resulted in water quality impairments, major infestations of midges, explosive growth of widgeon grass, periodic algae blooms, and the spread of invasive plants.

Under current conditions, the opening of the gates can raise or lower the pond about 1 foot during a tide cycle.<sup>1</sup> Until relatively recently Straits Pond was typically maintained at a level of 3.3 feet, NGVD 1929 with only occasional operation of the gates in an attempt to allow some exchange or increased flood storage prior to storm events. More recently, tide gate operators have been responsible for regulating flushing and water levels in Straits Pond by manually opening and closing the tide gates using a protocol developed by ENSR,<sup>2</sup> although management has deviated from this protocol due to various management goals.<sup>3</sup>

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<sup>1</sup> Army Corps of Engineers, 2004. Straits Pond Tidal Flushing Study- Hull, Cohasset and Hingham, Massachusetts. New England District, Concord, MA. 32 pp.

<sup>2</sup> ENSR Inc., 2002. Weir River Estuary Flow Study: Hull, Hingham, and Cohasset Massachusetts. Prepared for Massachusetts Department of Environmental Management. Document No. 04481-009.

<sup>3</sup> Army Corps of Engineers, 2004. Straits Pond Tidal Flushing Study- Hull, Cohasset and Hingham, Massachusetts. New England District, Concord, MA. 32 pp.



Figure 1: USGS Locus Map.



Twin 7-foot wide by 5-foot rise box culverts outfitted with automatically actuated sluice gates are proposed to replace the failing infrastructure and increase tidal circulation within Straits Pond. The Hull DPW will be the Responsible Party for undertaking water level management and routine actions, inspection, maintenance, repairs, and corrective actions as prescribed by the Straits Pond Advisory Committee.

## **PURPOSE AND INTENT**

In addition to replacing the failing infrastructure, the current project seeks to restore degraded coastal wetland habitat upgradient of the West Corner Bridge by increasing tidal exchange and improving water quality and habitat value within Straits Pond, and improving ecological connectivity to the Weir River Estuary while controlling the risk of preventable flooding from the Weir River and overwash along Atlantic Avenue. The attached Inspection and Preventative Maintenance Checklist (Attachment A) provides a standardized method of keeping records for regular inspections. The attached Tide Gate Adjustment Log (Attachment B), in addition to the automated water level data logging equipment installed at the culvert, insures adequate record keeping of water level management. Record keeping will create the ability to make informed management decisions regarding future modifications to the gate management protocol. Further protocols may need to be developed between these parties. This document will provide basic guidelines to assist Department of Public Works officials to:

- Manage Straits Pond with oversight by the Straits Pond Advisory Committee.
- Perform and document the inspections and other relevant information regarding the status of surrounding resources (Attachment A).
- Document adjustments made to tide gate operations and manual override actions (Attachment B).
- To insure that emergency contact information is available.

The culvert at West Corner is a tidal restriction site listed in the Atlas of Tidal Restrictions on the South Shore of Massachusetts (MAPC/MA Wetlands Restoration Program, 2001) as a high priority site for restoration based on the size of affected area (>50 Acres), the presence of an anadromous fishway, it's status as an Area of Critical Environmental Concern (ACEC), and for potential upstream benefits.

In 2002, an investigation into management alternatives to control nuisance infestations of Chronomid midges and excessive primary production was conducted by Environmental Science Services, Inc. (ESS)<sup>4</sup>. This study evaluated chemical, in-pond, and watershed management alternatives. One watershed management alternative identified in the report was flow improvements through such means as modifications to the tide gates at the Route 228 Bridge. This study articulated benefits of increased tidal exchange between the estuary and pond as "such improvements are expected to improve benthic and fisheries habitat and passage by increasing tidal exchange, flushing nutrients, increasing DO and salinity, and reducing water temperatures".

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<sup>4</sup> ESS 2002. Midge Management Recommendations for Straits Pond, Towns of Hull and Cohasset, Massachusetts. Prepared for Town of Hull 253 Atlantic Avenue Hull, Massachusetts 02045 Project No.: H114-000



In an effort to inform management and environmental issues the Straits Pond Watershed Association, in cooperation with local, state, and federal partners developed and presented a comprehensive public informational forum series that was recorded and presented on local cable access for those not able to make the forums in person (powerpoint presentations also available on the Hull Conservation Commission web page at [http://www.town.hull.ma.us/Public\\_Documents/HullMA\\_conservation/spforum](http://www.town.hull.ma.us/Public_Documents/HullMA_conservation/spforum) ). At the conclusion of the informational forum series a facilitated public meeting was held during which the most salient environmental issues and management options were identified and prioritized. Increased tidal exchange through an expanded and enlarged culvert was universally identified as the top priority.

The goals for the management of Straits Pond through monitoring and adjustments to the proposed tide gates include:

- Increase in tidal prism
- No increase in flooding-related property damage
- Increase and stabilization of pond salinity levels
- Increase in pore water salinity levels
- Decrease in pond temperature
- Increase and stabilization of pond dissolved oxygen levels, and
- Increase in estuarine nekton species assemblage
- Increase in frequency of tidal exchange

## **PRE-REPLACEMENT CONDITION**

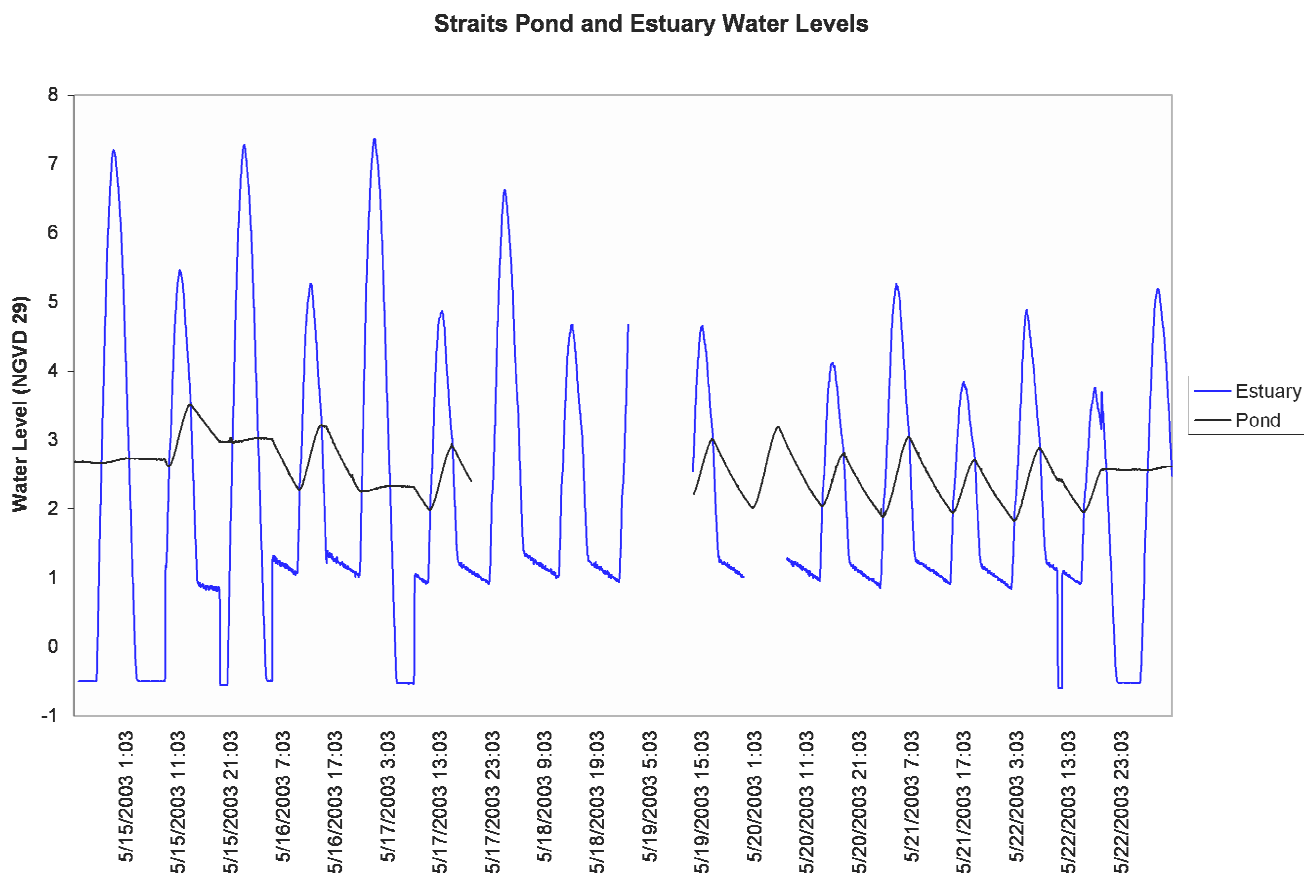
Straits Pond is a large coastal pond that is located in the southeast side of Hull and northwest side of Cohasset. The pond reportedly supported tidal marshes prior to being dammed in order to provide hydropower for a mill near the existing bridge. The grist mill remained until it was destroyed by fire in 1800. In as early as 1900, the state Board of Health investigated complaints of nuisance plant growth and nuisance odors.

The existing West Corner Bridge (Route 228) consists of a 12-foot span, 8-1/2 foot rise culvert with stone masonry walls, and a reinforced concrete slab roof. This structure was last reconstructed in approximately 1908.

Tide gates were added during the 1940s in response to recommendations to improve water quality within Straits Pond. The current tide gates are manually operated slide gates (one of which is 4x4 feet and the other is 5x5 feet). During the 1950's, funds were appropriated for the construction of sewers within Hull and various chemical treatments began in an attempt to control both nuisance vegetation and midges (a nonbiting insect which hatch in prolific numbers creating a major nuisance for abutters to the Pond). Some species of midges are direct indicators of poor water quality and excess nutrients. During peak emergence, residential areas are inundated with midges, leading to inhalation and respiratory problems that result in quality-of-life issues for Pond abutters. The Town of Hull has applied insecticides under an Emergency Declaration issued by the Board of Health since the 1950's. However, the chemical control of midges generally has limited and short-term success and was discontinued in 2004.

A 1980 study cited continued eutrophication problems due to failing septic systems, direct discharge of sewage and storm water runoff. In subsequent years, additional sewer and stormwater management improvements have been implemented in Hull and Cohasset to reduce pollutant levels entering Straits Pond. Midge larvae numbers have been regularly monitored by professionally guided local volunteers and high school students. In the past, the Pond was typically managed to maintain a constant water level and the tide gates were manually operated to lower water levels in response to a predicted storm event to increase available water storage capacity. More recently, a protocol for more regular tidal flushing has been implemented to increase salinity levels and numbers of predatory fishes during spring months as a more effective midge control measure. A study of midges in Straits Pond revealed that midges taken from the Pond ceased to pupate and often died at salinities greater than 18-22 ppt. Additional studies of Straits Pond have shown that fish such as mummichogs and striped killifish fed extensively on midges, although ceased to feed or died at high water temperatures and low oxygen conditions.

The lack of effective tidal exchange within the Pond continues to cause water quality impairments, major infestations of midges, explosive growth of widgeon grass, periodic algae blooms and infestations of midges, and the spread of invasive plants. Figure 1 graphically represents tide data collected in May, 2003 and demonstrates the limited water level fluctuation within Straits Pond with both existing gates in an open position. Under moderate tides, the Pond can only experience water level fluctuations of approximately 1 foot between high and low tides.



**Figure 2: March 2003 Tide Data for Straits Pond and Weir River Estuary.**

Stands of the invasive common reed or *Phragmites* reduce habitat value and are a considerable fire hazard. Low-lying properties surrounding the pond are susceptible to flooding impacts as flow becomes impounded above the road crossing. All of these symptoms present significant quality-of-life issues for residents surrounding the pond.

Historically, Straits Pond was maintained at a constant level of 3.3 feet, NGVD 29. More recently, a resident has been responsible for regulating flushing and water levels in Straits Pond by manually opening and closing the tide gates using a protocol developed by ENSR<sup>5</sup> in an attempt to increase tidal flushing and salinities and reduce residential time within the pond. These operations are the subject of an Existing Order of Conditions with the Hull and Cohasset Conservation Commissions. However, for several seasons the tide gates have not been operated per the ENSR protocol. Most recently the tide gates have been operated under an OOC that was based on the investigation of several management scenarios evaluated using automated level data loggers and in-situ salinity measurements that provided improvements over the ENSR protocol. This spring the revised operational scenario was altered as the existing ENSR tidal exchange protocol was insufficient to maintain high salinity values in the Pond during wet weather and high spring flow/groundwater conditions. Under the interim protocol the tide gates are operated in the open position as often as possible while attempting to maintain pond height in a range between approximately 2.4 and 3.4 feet NGVD 29. The gates have been open for approximately 1 week of the month during the highest high tides. During the two weeks of the month with roughly average tides, the gates have been closed for approximately 6 hours per day during one low tide cycle. During neap tides it is periodically necessary to close the gates for portions of both daily low tide cycles in order to achieve pond elevations above 3.0. Manual operations of the gates also occur in response to predicted major precipitation or coastal storm events in an effort to lower water levels and provide additional flood water storage capacity.

## REPLACEMENT CONDITION

The project originated as a municipal project led by the Town of Hull with additional financial support from the Towns of Cohasset and Hingham, as well as the NOAA National Marine Fisheries Service and the Conservation Law Foundation in support of habitat restoration goals. The project recently received federal funding for construction through the Federal Highways Administration and as a result will be advertised as a MassHighway project. In addition, the project has received additional funding from the Massachusetts Transportation Improvement Program (TIP). The replacement design of twin 7-foot wide by 5-foot rise box culverts outfitted with automatically actuated sluice gates is based upon recommendations from a US Army Corps of Engineers study (include citation). This study conducted under the Flood Plain Management Services Program, determined that larger hydraulic openings than the recommended twin 7 X 5 foot culverts provided only minor additional flow to the Pond. The predicted range in pond surface elevation (during a relatively low high tide event of 5.2 feet, NGVD 1929), is anticipated to increase from 1.2 feet to 2.6 feet, with the new culvert/tide gate structure. While the predicted minimum pond surface elevation is controlled by an outcrop of bedrock, higher maximum pond surface elevations would be anticipated during higher tide events without resulting in flooding impacts to properties abutting the Pond which through pre-construction topographic surveys has been determined to be approximately 3.8 feet (NGVD 29). The automatic tide gates will also be outfitted with manual overrides for corrective actions and emergencies, including power failures.

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<sup>5</sup> ENSR Inc., 2002. Weir River Estuary Flow Study: Hull, Hingham, and Cohasset Massachusetts. Prepared for Massachusetts Department of Environmental Management. Document No. 04481-009.



Studies of water quality conducted by the Office of Coastal Zone Management have found that with the existing tide gates left in an open position, salinity levels significantly increase throughout the Pond both spatially and at depth and water released on an outgoing tide is not the same water that returns on a subsequent incoming tide. It is anticipated that the predicted increase in tidal exchange with the new culverts will result in further water quality and habitat enhancements, will reduce habitat fragmentation, and increase ecological integrity.

The Town of Hull DPW will maintain signage on both sides of the culvert warning boaters and kayakers to stay out of area adjacent to the culvert.

## **STRAITS POND ADVISORY COMMITTEE**

The Hull Department of Public Works is the Responsible Party for undertaking initial water level monitoring and water quality monitoring, adjusting gate operations, conducting necessary inspections, maintenance and repairs, and undertaking corrective actions as prescribed by the Straits Pond Advisory Committee. Restoration monitoring of water quality, vegetation, nekton, sediment, and benthic invertebrates is ongoing and being performed by the Straits Pond Watershed Association (SPWA) and the Cohasset Center for Student Coastal Research (CSCR) with technical and financial support from the CZM Wetland Restoration Program, the MassBays Program, and the Gulf of Maine Council on the Environment. The Straits Pond Advisory Committee is responsible for developing a management approach with regard to initial calibration, review of environmental conditions and prescribing modifications when necessary. Members of the Advisory Committee are identified below:

Director, Hull DPW  
Attn: Marc Fournier  
9 Nantasket Avenue  
Hull, MA 02045  
P: 781-925-0900  
781-910-3973 (Emergency)  
F: 781-925-0401  
E: [mfournier@town.hull.ma.us](mailto:mfournier@town.hull.ma.us)

CZM South Shore Regional Coordinator or  
CZM Wetland Restoration Program  
Attn: Jason Burtner  
C/O: Stellwagen Bank National Marine  
Sanctuary  
175 Edward Foster Road  
Scituate, MA 02066  
P: 781-545-8026 x209  
F: 781-545-8036  
E: [jason.burtner@state.ma.us](mailto:jason.burtner@state.ma.us)

MA DEP Restoration Coordinator  
Attn: James Sprague  
1 Winter Street  
Boston, MA  
P: 617-645-6601  
E: [James.Sprague@state.ma.us](mailto:James.Sprague@state.ma.us)

MassBays Estuaries Program  
Attn: Christian Krahforst  
251 Causeway Street  
Boston, MA 02041  
P: 617-626-1216  
F: 617-626-1240  
E: [Christian.Krahforst@state.ma.us](mailto:Christian.Krahforst@state.ma.us)

Areas of Critical Environmental Concern  
(ACEC) Program  
Coastal Coordinator  
Attn: Lisa G. Berry Engler  
251 Causeway Street, Suite 700  
Boston, MA 02114  
T: (617) 626-1435  
F: (617) 626-1349  
[Lisa.Engler@state.ma.us](mailto:Lisa.Engler@state.ma.us)

Hingham Conservation Agent  
Attn: Cliff Prentiss  
210 Central Street  
Hingham, MA 02043  
P: 781-741-1445  
E: [cprentiss@hingham-ma.com](mailto:cprentiss@hingham-ma.com)

Conservation Administrator  
Hull Conservation Commission  
Attn: Anne Herbst  
253 Atlantic Avenue  
Hull, MA 02045  
P: 781-925-8102  
F: 781-925-8509  
E: [conservationemail@town.hull.ma.us](mailto:conservationemail@town.hull.ma.us)

Gulf of Maine Habitat Restoration  
Coordinator  
Attn: Eric W. Hutchins  
NOAA Restoration Center  
1 Blackburn Drive, Gloucester, MA 01930  
P: 978-281-9313  
F: 978-281-9301  
E: [Eric.Hutchins@noaa.gov](mailto:Eric.Hutchins@noaa.gov)

Straits Pond Watershed Association  
Attn: Lawry Reid  
31 Richards Road  
Hull, Ma 02045  
P: 781-925-8659  
E: [viaspeech@comcast.net](mailto:viaspeech@comcast.net)

Conservation Agent  
Cohasset Conservation Commission  
Attn: Paul Shea  
41 Highland Avenue  
Cohasset, MA 02025  
P: 781-383-4119 or  
508-240-6811  
E: [PaulShea@cape.com](mailto:PaulShea@cape.com)

Superintendent  
Cohasset DPW  
Attn: Carl Sestito  
91 Cedar St.  
Cohasset, MA 02025  
P: 781 383 0273  
F: 781 383 4125  
E: [cohassetdpw@yahoo.com](mailto:cohassetdpw@yahoo.com)

The initial testing and configuration of the automatic tide gate actuators will be scheduled with the contractor well in advance of installation. Configuration will require careful testing in order to achieve the targeted water elevation and water elevation change within Straits Pond. The Straits Pond Advisory Committee will provide oversight for initial testing and operation. It is anticipated that water quality habitat degradation, and ecological integrity problems will be improved with the increased tidal flushing allowed by the larger tide gates. An increase in tidal exchange will also provide fisheries benefits through increased opportunity for fish passage between the estuary and the pond, will reduce habitat fragmentation resulting from existing tide gate design/operation, and that the improved ecological “connectivity” between the pond and the estuary will enhance the pond’s ability to respond to environmental stressors such as nutrient loading and eutrophication. An increase in the degree and frequency of tidal exchange will serve to increase and stabilize salinity, lower and stabilize water temperature, and that with a reduction in eutrophic conditions water column dissolved oxygen is anticipated to improve and sediment oxygen demand is anticipated to be reduced thereby improving overall habitat value. However, the need for adaptive management remains a priority. Adverse environmental conditions are to be managed with advanced coordination and oversight by the Straits Pond Advisory Committee.

## INITIAL TIDE GATE CALIBRATION AND OPERATION PROTOCOL

### Maximum Water Level

Once the existing structure and tide gates are replaced, maximum water surface elevations would be controlled by the new automatically actuated sluice gates which would automatically close when the Pond reaches a predetermined water surface elevation and automatically open when elevations within the Estuary would fall below this elevation. The first action of the Hull DPW with input from the Straits Pond Advisory Committee will be the initial adjustments of the level switches to determine the appropriate Pond and Estuary water levels which will actuate the gates to prevent flooding from high water levels. The elevation of the pond water level will be automatically recorded by a GlobalWater WL16 unit that is mounted in the vicinity of the tide gates and will be configured to record water level at regular intervals so as to be comparable with the NOAA Boston recording facility. These adjustments will require careful monitoring of water levels to establish a maximum water level acceptable to local officials and Straits Pond abutters without causing avoidable adverse consequences to low-lying structures surrounding the Pond. The maximum water elevation is anticipated to be approximately 3.8 feet (NGVD 1926) or approximately 0.5 feet higher than typical high water conditions. During the initial configuration stage, tide gauges and salinity probes will be deployed within the Pond and Estuary to document water levels and salinity levels, water flow direction and velocity, water temperature, and dissolved oxygen in response to adjustments of the level switches. The automated actuators will initially be set to close the tide gates at a pond water level of approximately +3.5 feet (NGVD), or at the currently observed/recorded average high water level. Following the preliminary data collection phase for the initial setting, of approximately one month, the Straits Pond Advisory Committee will meet to review the available data and any reported concerns regarding pond water levels. The outcome of this meeting will be to establish the water level settings for the switches which will activate the gates under routine conditions. Based on the maximum water levels resulting from the initial actuator setting water level and closure settings will be incrementally adjusted to maximize pond water levels without flooding and with consideration of a reasonable safety factor. The intent is to incrementally adjust actuator settings once during each spring to facilitate better environmental response data collection.

### Minimum Water Level

Establishing the maximum water level is only one tide gate O&M variable for restoration, relieving eutrophic conditions, addressing the midge infestations, etc and all of the associated quality-of-life issues that go along with the impairment of the Pond. Consideration of the minimum water level (i.e. tidal prism) and frequency of exchange are also critical considerations as they, collectively, will be what determine the degree and success of restoration and improvement of conditions for abutters. It is anticipated that the minimum water level in the pond will be a self-controlling function of culvert/tide gate design and pond channel/ledge bathymetry. The predicted range in pond surface elevation (during a relatively low high tide event of 5.2 feet, NGVD 1929), is anticipated to increase from 1.2 feet to 2.6 feet, with the new culvert/tide gate structure. This increase in the tide range is a result of expanded cross-sectional area of the culvert/tide gates and the associated hydrology of the system. The minimum potential water level in the pond is controlled by a ledge outcropping upgradient (pond-side) of the tide gates and the corresponding low water pond water elevation is approximately +1.0 feet (NGVD). At this minimum water level there is approximately 75% surface water coverage on the pond. This minimum level surface water coverage has been determined by detailed bathymetric survey and photographic documentation when the Pond water level was in a drawn down condition. As +1.0 feet is a fixed minimum water level, and the average low water elevation during tidal exchange will primarily be higher than this level, it is anticipated that the large degree of surface water coverage during the transitional/short term low tide in the Pond will be sufficient to address abutter concerns regarding



prolonged exposure of extensive inter-tidal flats as discussed during project public informational meetings. This lower water elevation is viewed as a longer-term goal of the restoration and the Advisory Committee. The initial actuator low water setting will seek to maintain a minimum water surface elevation of 2.0 feet (NGVD 29) with annual incremental adjustments of approximately 0.2 feet annually over a 5-6 year period. These adjustments will be determined by the Advisory Committee taking into consideration abutter concerns and adaptive management strategies that will be informed by ongoing restoration monitoring and in coordination with the appropriate permitting agencies. The Advisory Committee will need to consider the balance between maximized exchange and abutter concern with low water levels in the pond.

Protocol for drawing down the level of the pond to provide additional flood storage in anticipation of a significant storm event is discussed below.

### **Tidal Exchange Frequency**

In order to maximize potential benefit for water quality, habitat, ecological integrity and quality-of-life considerations for residential abutters, tidal exchange between the estuary and the pond will be allowed to proceed unimpeded (except as discussed above and below) on a normal twice-daily regime in order to more closely mimic native hydrology and ecology of the tidal system.

The automatic tide gates will also be outfitted with manual overrides for corrective actions and emergencies, including power failures. This initial monitoring phase will also be useful to establish the time frames necessary to respond to a predicted major precipitation of a coastal storm flooding event where lowering pond levels is desirable for increased flood storage. In certain circumstances, more than a single ebb tide cycle may be necessary to lower the pond to elevation 1.0 feet (NGVD 1929). This is the maximum lowering possible due to bedrock outcrops within Straits Channel just upstream of West Corner Bridge. During this initial monitoring phase, the Straits Pond Advisory Committee will establish the minimum respond times (tides cycles) required for the manual operation of the gates for increased flood water capacity.

## **ROUTINE FIELD INSPECTIONS**

Following the installation of the new culverts, routine annual field inspections will be conducted by the Hull Department of Public Works using the Inspection and Preventative Maintenance Checklist (Attachment A) and kept on record by the DPW. The routine inspections will evaluate performance, address maintenance needs and identify problems. Substantial corrective actions requiring the removal or placement of material via machinery will be reviewed and approved by the Advisory Committee. The Department of Public Works will be the primary contact to report observed problems with the functioning of the structure.

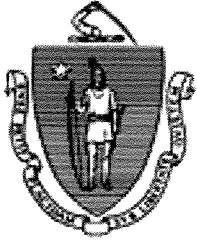
## **TIDE GATE ADJUSTMENTS AND MANUAL OVERRIDE EVENTS**

All adjustments to the level switches which operate the tide gates will be coordinated with the Straits Pond Advisory Committee. The attached Tide Gate Adjustment Log (Attachment B) and the automated water level data loggers will insure adequate record keeping of water level management including all manual overrides of the gates. Record keeping will create the ability to make informed management decisions. Based on circumstances which may occur following installation, further protocols may become necessary. It is anticipated that the Advisory Committee will meet on an annual basis to review records and reports from the previous year and determine whether any adjustments to tide gate operations

are warranted. Any modifications to operating procedures will be developed in cooperation with the Advisory Committee and clearly documented. Records of tide gate adjustments and operations will be distributed to municipal officials and resource agencies as directed by permit conditions.

## **ON-GOING TIDE GATE OPERATIONS**

By December 15<sup>th</sup> of each year, the Straits Pond Advisory Committee will prepare a summary report. The report will document and justify any modifications or adjustments made to gate operations with supporting monitoring data. It is anticipated that this information will include data on water levels, salinity, temperature, and DO,. The report will discuss observed trends in the data and the extent to which to project is achieving management goals. To the extent that additional data is collected, it will be provided in the annual report.



COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

ARGEO PAUL CELLUCCI  
Governor

JANE SWIFT  
Lieutenant Governor

BOB DURAND  
Secretary

LAUREN A. LISS  
Commissioner

April 4, 2001

Mr. Jeremiah Mulcahy  
c/o Mr. Robert Alvarez  
P.O. Box 250  
Wareham, MA 02571-0250

RE: **Formal Determination of Applicability, W00-0025**  
**33 Bay Street, Hull, Weir River, Plymouth County**

Dear Mr. Alvarez:

Thank you for requesting to know whether M.G.L. Chapter 91, the Public Waterfront Act and the Waterways Regulations 310 CMR 9.00, apply to the above referenced site. The Department appreciates the applicant's patience in the review process as we have worked through the complex issues raised by this application.

The proposed project involves the construction of a former home at 33 Bay Street in the town of Hull. The previous structure received three emergency authorizations from the Department to repair pile supports on February 27, 1998; April 8, 1998; September 29, 1998. The home has since been completely removed and unauthorized pilings placed on the site. A previous application with the file number of W98-8959-N is noted as withdrawn in this request.

Enclosed is the Determination of Applicability for the referenced application issued pursuant to Waterways Regulations 310 CMR 9.06. This Determination may be recorded at the Plymouth County Registry of Deeds and a copy will be maintained in the Department files.

The Department has been in extensive consultation with the National Oceanographic and Atmospheric Administration (NOAA) over the exact elevation of MHW based upon the NTDE 1960-1978 pursuant to 310 CMR 9.04 related to the NGVD 29 datum plane in the Weir River area of Hull. The Department has determined, in cooperation with NOAA officials, that the elevation of MHW in NGVD 29 is 4.99ft. Furthermore, NOAA estimates sea level rise since the 1960-1978 NTDE to be approximately 0.1ft. In light of these facts, the soon to be published new NTDE should render MHW in NGVD 29 for the area around 5.1ft.

Based upon spot elevations you provided, the Department has determined the proposed project is located within a geographic area subject to jurisdiction pursuant to 310 CMR 9.04(1) and the construction would require the submission of a license application pursuant to 310 CMR 9.05(1). As noted, the new NTDE will expand the Department's jurisdiction, encompassing more of the structure in the near future.

This information is available in alternate format by calling our ADA Coordinator at (617) 574-6872.

DEP on the World Wide Web: <http://www.magnet.state.ma.us/dep>

Printed on Recycled Paper



A significant portion of the site, including the sonotube supports, for the proposed structure were submersed in tidewater at the afternoon high tide of October 18, 2000. Likewise, the applicant noted in a March 26, 1998 letter that they were unable to pour new supports due to incoming tides when requiring an extension to the original emergency authorization. Noting the very gradual slope of the shore at this particular site, the Department believes that many higher high tides inundate most of the site.

The Department recognizes the complexities of this case and that the new construction of the home would not qualify for a variance pursuant to 310 CMR 9.21(1). Furthermore, the structure is not eligible for the simplified procedures pursuant to 310 CMR 9.10(1) as the primary residential structure cannot be considered accessory. Accordingly, the structure should be moved in the horizontal plane landward to ensure that the elevation of MHW is seaward of the structure currently and in the new NTDE and thus removing the structure from jurisdiction.

This formal determination is only for purposes of M.G.L. Chapter 91, and you may be required to obtain other local, state or federal authorizations for development, including but not limited to, any approvals which may be required pursuant to the Wetlands Protection Act.

If you have any questions or wish to schedule a pre-application meeting please feel free to contact me at the Waterways Regulation Program at (617) 292-5869.

Sincerely,

Christian D. Schock II, AICP  
Regional Planner  
Waterways Regulation Program

cc: Jeremiah Mulcahy, Applicant  
Town of Hull, Conservation Commission  
DEP- NERO  
WRP Files

## Appendix I

### *Stormwater Management Report*

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**STORMWATER REPORT for  
Reconstruction of Atlantic Avenue  
and Related Work  
Nantasket Avenue to Cohasset Town Line  
HULL, MA**

**APPLICANT:  
TOWN OF HULL  
DEPARTMENT OF PUBLIC WORKS  
9 NANTASKET AVE  
HULL, MA 02045**

**CHA Project #25463**

**SEPTEMBER 2020**

***Submitted To:***

Hull Conservation Commission  
Hull Town Hall  
253 Atlantic Ave  
Hull, MA 02045

***Prepared By:***

CHA Consulting, Inc.  
141 Longwater Drive, Suite 104  
Norwell, MA 02061  
p (781) 982-5400  
f (781) 982-5490







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## ***Section 1***

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### ***Narrative***





## **1.1 EXECUTIVE SUMMARY**

On behalf of the Hull Department of Public Works, CHA Consulting, Inc. is pleased to provide the following Stormwater Engineering Report for the Atlantic Avenue Corridor Improvement Project. Following is a description of the existing conditions of the roadway and the proposed improvements to be implemented as part of the project.

### **Purpose and Need**

The Atlantic Avenue Reconstruction Project in Hull, MA is a 1.3-mile corridor improvement project with the goal of rehabilitating the existing roadway infrastructure, improving drainage, improving intersection safety, and enhancing bicycle and pedestrian accommodations. The project is needed to address aging infrastructure and safety for all roadway users along Atlantic Avenue between Nantasket Avenue and the Cohasset Town Line.

### **Existing Conditions**

The project encompasses approximately 6,600 feet of Atlantic Avenue between Nantasket Avenue (Route 228) and the Cohasset town line. Atlantic Avenue is designated as an Urban Minor Collector. The paved travel way varies in width from 24 to 32 feet and the Right of Way varies from 40 to 45 feet along the corridor. The roadway handles approximately 3,900 vehicles daily that increases during the summer months. The homes along the majority of Atlantic Avenue that were once summer cottages are now year round residences. This change has affected the use and demands placed upon this roadway.

Atlantic Avenue is bordered on the north by a combination of residential and commercial properties and beaches along the Atlantic Coast. To the South, residential properties and Straits Pond, a salt pond that flows into the Weir River, which is collectively designated as an Area of Critical Environmental Concern (ACEC), border Atlantic Avenue. The roadway right-of-way is adjacent to areas of salt marsh, beach, and several revetments. In addition, the portion of Atlantic Avenue around Straits Pond is located within the 100-year flood plain, is designated as Special Flood Hazard Areas, Coastal Flood Zone, and is considered land subject to coastal storm flowage and/or land subject to flooding under the Massachusetts Wetlands Protection Act Regulations.

Bituminous concrete sidewalks are in very poor condition along the south side of the roadway for the project's entire length. Isolated sections of sidewalk are located along portions of the northern side of Atlantic Avenue, mainly in the thickly settled residential area. Several side streets have sidewalks, but with virtually no connecting walkways, pedestrian access between streets is restricted. Parallel parking by permit exists along portions of the south side of Atlantic Avenue. The Hull Town Hall, Marylou's Coffee, basketball court/park, and multiple beach access points are located along the project corridor serving as pedestrian generators.

Stormwater runoff along the roadway is collected by multiple closed drainage systems consisting of catch basins and manholes. The stormwater is conveyed to various outlet points along the corridor, many of which discharge directly to Straits Pond. The existing drainage structures appear to be in poor condition and most will be replaced.

## **Proposed Improvements**

### *Roadway Cross Section*

The proposed cross section for the majority of Atlantic Avenue is a 30-foot wide roadway with a 5.5-foot sidewalk running along the south side of the road for the full length. The 30-foot roadway consists of two 11-foot lanes and two 4-foot shoulders. The 4-foot shoulder widths are in accordance with the required 4-12 foot width stated in Section 5.3.3.1 of the Design Guide. The 11-foot wide travel lanes also meet the required width of 11 to 12 feet stated in Section 5.3.3.3 of the Design Guide.

A 33-foot wide cross section is proposed in areas where restricted parking is currently permitted along the corridor. This roadway consists of two 11-foot lanes and a 7-foot shoulder on the south side and a 4-foot shoulder along the north side of Atlantic Avenue.

### *Bicycle & Pedestrian Accommodations*

The proposed improvements include reconstructing the existing sidewalks along Atlantic Avenue and providing wheelchair ramps, compliant with current ADA and MassDOT standards at intersections and driveways. Widening of the roadway to a minimum of 30 feet will improve bicycle accommodations by providing adequate room for vehicles and bicycles to safely share the roadway. New signage and pavement markings will also be installed throughout the corridor for improved bicycle and pedestrian awareness.

### *Drainage Improvements*

It is proposed to replace the vast majority of the drainage system, with 74 new deep sump catch basins, 43 new drain manholes, and approximately 5230 feet of a combination of ductile iron pipe (DIP) and reinforced concrete pipe (RCP). Vertical granite curbing is proposed throughout the corridor to create a closed drainage system that directs stormwater to the proposed inlets. There is a total of 12 existing drainage outlets along the project. The proposed modification, if any, to these outlets is shown below. Three (3) of the outlets will be abandoned due to the modifications of the proposed drainage system. Seven (7) of the outlets will be replaced due to the poor condition of the existing pipes and/or to increase the size of the outlet as required. Stone dissipator pads to reduce outflow velocities and erosion are proposed at locations based on field investigation of each individual area. Because Straits Pond is an ACEC, careful consideration with recommendations from a wetland scientist from CHA and MassDOT was given to each outlet. Stone dissipaters qualify as permanent impacts to the ACEC and are only proposed where appropriate based on outflow velocities, adjacent topography, and proximity to the ACEC.

<u>Location</u>	<u>Type</u>	<u>Receiving Waterbody</u>	<u>Disposition</u>
Atlantic Ave. 4+67 RT	8" CMP	Wetland, behind residence	Retain
Atlantic Ave. 19+76 RT	12" RCP	Straits Pond	Abandon
Atlantic Ave. 21+44 RT	12" RCP	Straits Pond	Replace w/ 18" RCP & tide gate
Atlantic Ave. 26+19 LT	12" RCP through Retaining Wall	Gunrock Beach/ Atlantic Ocean	Abandon
Atlantic Ave. 32+66 RT	12" RCP	Straits Pond	Replace w/ 15" DIP, install rip rap slope protection, stone dissipator pad & tide gate
Atlantic Ave. 38+31 RT	12" CMP	Straits Pond, behind residences	Retain
Atlantic Ave. 51+16 RT	8" PVC	Straits Pond	Replace w/ 12" RCP, install tide gate
Atlantic Ave. 54+00 RT	8" CI	Straits Pond	Replace w/ 12" RCP, install tide gate
Atlantic Ave. 57+87 RT	Record 9" Pipe (deteriorated and not visible in field)	Straits Pond	Replace w/ 12" DIP, install tide gate
Atlantic Ave. 60+48 RT	Record outlet (area washed out and pipe not visible in field)	Straits Pond	Abandon
Atlantic Ave. 62+03 RT	8" C.I.	Straits Pond	Replace w/ 12" DIP, install tide gate
Atlantic Ave. 62+79 RT	10" C.I.	Straits Pond	Replace w/ 12" DIP, install stone dissipater pad & tide gate

Catch basin to catch basin connections will be eliminated and a new closed drainage trunk line system constructed. Surface "scupper" pipes discharging stormwater directly from the roadway gutter at Sta. 54+00 and Sta. 62+03 will be eliminated and a closed drainage system proposed to collect surface runoff. Tide gates are proposed at the ends each of the new outlet pipes and will prevent tidal water from washing out the drainage system. Poor soils, right-of-way constraints, and inadequate separation from groundwater limit opportunities to construct stormwater BMPs as outlined in Section 1.4.

### *Safety Improvements*

Safety improvements are proposed throughout the corridor. Lane and shoulder widths will meet MassDOT minimum requirements for major collector roadways, which will improve safety for vehicles and bicyclists. Sight distance at intersections has been reviewed and improvements made where possible.

Existing traffic signs that are in poor condition, or that are not warranted, will be removed. New regulatory and warning signs conforming to the provisions of the MUTCD and MassDOT will be installed. These signs will be consistent with the proposed roadway

design. Thermoplastic pavement markings are proposed to delineate the traveled ways, shoulders, stop lines, and crosswalks.

## **1.2 OBJECTIVE OF STORMWATER CALCULATIONS**

The purpose of this stormwater analysis is to examine the stormwater runoff from the proposed site based upon the Stormwater Management Policy as revised in February 2008. In addition, the design uses BMPs to the extent practicable to reduce source runoff and remove suspended solids.

Stormwater management will be provided according to latest policy established by the Massachusetts Department of Environmental Protection Stormwater Management Policy as revised, and the applicable requirements of the Town of Hull. The goal of the stormwater management system design on this project is to provide water quality improvements and protect the surrounding area from any potential flooding and/or environmental impacts associated with the unmitigated condition.

## **1.3 METHODOLOGY**

Hydraflow Storm Sewers extension for AutoCAD Civil 3D is an easy-to-use, full-featured computer program for urban hydrosystems engineering. The software is utilized as a tool in hydraulic analysis of storm sewer networks. The program can be used to determine the hydraulic grade line for both existing and proposed storm sewer systems. Storm and Sanitary Analysis utilizes the rainfall intensities from IDF curves to determine flows based on the Rational Method.

The site consists of soils with HSG classifications from “A” to “C” type based on soil groups mapped by the USDA Web Soil Survey Map. The soil in the project location consist of Canton-Chatfield rock outcrop complex (HSG A), Paxton fine sandy loam (HSG C), Newsfield fine sandy loam (HSG B), Oxyaquic Udipsammments (HSG A), Canton Urban Land rock outcrop complexes (HSG A), and Urban land-Hooksan complex (HSG A).

## **1.4 COMPLIANCE WITH STORMWATER MANAGEMENT STANDARDS**

The following is an explanation on how the proposed project meets the Stormwater Management Standards as prepared by the Massachusetts Department of Environmental Protection, Revised February 2008. Please refer to the Stormwater Checklist and Certification in Section 5 for additional documentation related to both the site and access road.

**Standard 1: No New Untreated Discharges** – The project is considered redevelopment and meets this standard to the maximum extent practicable. Stormwater runoff will be directed to existing discharge points and no new discharge locations are proposed. Several discharge pipes will be replaced and enhanced with runoff velocity dissipator stone pads as outlined on page 3 to prevent erosion. Three discharge points will be abandoned. Previous stormwater runoff to these discharge points will be redirected to nearby existing points.



Tide gates are proposed at outlets along Straits Pond to prevent tidal fluctuations from washing out the stormwater drainage system.

**Standard 2: Peak Rate Attenuation** – The project meets this standard to the maximum extent practicable. The project scope includes roadway reconstruction with minor widening. The project will result in an increase of approximately a 0.03-acres of impervious surfaces over the 1.3-mile long project. This includes both roadway widening and sidewalk areas. There are large impervious areas being removed at certain intersections that will offset the proposed roadway widening and sidewalks. Many of the areas where roadway widening will occur are impervious or unvegetated disturbed areas, which may contribute untreated, silt-laden runoff to resource areas. The project will provide granite curb along the edges of roadway, revegetate the edges of roadway, and prevent gutter flow from eroding these disturbed areas. This widening will yield a minimal increase in the flow and volume to the outlets. Stone dissipater pads are proposed where appropriate, based on impacts to Straits Pond, topography, and discharge velocities, to mitigate the increase in flow due to the proposed closed drainage system and widening.

Detention BMP's were considered for this project but ultimately deemed not practicable due to a high groundwater table, proximity to the Straits Pond ACEC, and lack of suitable land due to topography and abutting residential buildings near discharge points.

**Standard 3: Recharge** – The project meets this standard to the maximum extent practicable. The project will result in a 0.03 increase in impervious surfaces over the 1.3 mile long project that will constitute a minor reduction in groundwater recharge over existing conditions.

Recharge BMP's were considered for this project but ultimately deemed not practicable due to a high groundwater table, proximity to the Straits Pond ACEC, and lack of suitable land due to topography and abutting residential buildings near discharge points.

**Standard 4: Water Quality** – The project meets this standard to the maximum extent practicable. The proposed stormwater management system improves upon the existing drainage by eliminating catch basin-to-catch basin connections. Seventy-four (74) new deep sump catch basins (25% TSS removal) are proposed as a part of this project. The proposed tide gates at discharge points along Straits Pond will prevent tidal fluctuations from washing out the drainage system. See Section 4.1: Water Quality Calculations and Section 4.2: Total Suspended Solids Calculations.

Water quality BMP's were considered for this project but ultimately deemed not practicable due to a high groundwater table, proximity to the Straits Pond ACEC, and lack of suitable land due to topography and abutting residential buildings near discharge points.

**Standard 5: Land Uses with Higher Pollutant Loads** – Standard 5 does not apply to the project. There are no land uses with higher pollutant loads within the project area.

**Standard 6: Critical Areas** – The project meets this standard to the maximum extent practicable. The project abuts Straits Pond, a portion of the Weir River ACEC which is a Outstanding Resource Water (ORW). Straits Pond is not classified as an impaired water body by the DEP, but due to tidal interchange with the Weir River estuary at the tide gate under Nantasket Avenue, it may have elevated levels of fecal coliform. Roadway reconstruction and related improvements associated with this project are not anticipated to increase levels of the identified impairments. Existing discharges that convey surface runoff directly to the pond are proposed to be collected in a closed drainage system with deep sump catch basins and tide gates to improve treatment over existing conditions (see Standard 4). In addition, the project offers some spill prevention by improving pavement condition, roadway drainage, intersection geometry, and installing new guardrail that will reduce the likelihood of errant vehicles entering Straits Pond.

**Standard 7: Redevelopment and Other Projects Subject to the Standards only to the maximum extent practicable** – The project is a redevelopment and the design is subject to meet Stormwater Management Standards #2, #3, and the pretreatment and structural stormwater BMP requirements of Standards #4, #5, and #6 to the maximum extent practicable. Existing stormwater discharges will comply with Standard #1 only to the maximum extent practicable. The project will also comply with all other requirements of the Stormwater Management Standards and improve upon existing conditions as outlined throughout this report.

**Standard 8: Construction Period Pollution Prevention Plan and Erosion and Sedimentation Control** – The project meets this standard. The Contractor will be required to obtain a NPDES Construction General Permit containing a Construction Period Pollution Prevention Plan. Erosion and sedimentation control (ESC) measures consisting of compost filter tubes and silt fence will be installed at the limits of work within and adjacent to the buffers to coastal beach, coastal bank, and vegetated wetlands/ salt marsh prior to the commencement of construction. Earth moving activities will be conducted only after the ESC measures are installed and inspected.

**Standard 9: Operation and Maintenance Plan** - The project meets this standard. An Operation and Maintenance plan has been customized to fit the design of the road improvements. Provisions to maintain runoff control devices have been assured through structural, non-structural, and construction management approaches. See Section 2: Long-Term Pollution Prevention Plan.

**Standard 10: Prohibition of Illicit Discharges** – The project meets this standard. The Operation and Maintenance plan required by Standard 9 includes measures to prevent illicit discharges. Illicit discharges will be discontinued where the elimination of these discharges will not result in stormwater damages to contributing parcels. An Illicit Discharge Compliance Statement is included within this report (See Section 6: Illicit Discharge Statement).

## 1.5 BEST MANAGEMENT PRACTICES (BMPs)

A system of street sweeping and deep sump catch basins will be used to treat stormwater runoff. See Section 4.2: Total Suspended Solids (TSS) Calculations. A description of the devices incorporated is indicated below.

### 1. DEEP SUMP CATCH BASINS (74 Each)

Deep sump catch basins are modified versions of inlet structures typically installed on city streets. The deep sumps, with a 4 ft. minimum depth below the invert, are most effective if placed “off-line”, that is they do not have inlet pipes. Deep sumps provide capacity for sediment accumulation and can serve as pretreatment for other downstream BMPs. Gutter inlets are proposed to be connected to drainage manholes with a 4 ft. sump.

## 1.6 HYDRAULICS AND PIPE SIZING

The closed-conveyance storm drain collection system was analyzed using the Rational Method.

$Q=CiA$  for estimating runoff where C is a coefficient dependent on land cover, i is storm intensity in in/hr based upon published I-D-F curves, and A is area in acres. Q or flow is calculated in cubic feet per second

The project site and access roads were subdivided by catch basin or inlets based upon contributory drainage areas. A C value for each area was assigned based upon overall character of land. C values ranged from 0.9 in paved/impervious conditions to 0.3 for grass and landscaped areas. IDF curves from Boston, Massachusetts are used to establish the rainfall rate for the 10-year event.

Pipe hydraulic design was completed using Manning’s full flow capacity equation for circular pipe with a n-value of 0.013 for concrete, 0.012 for Ductile Iron, and 0.011 for PVC.

$Q = 1.49/n AR^{2/3} S^{1/2}$  where, n is coefficient depending on channel roughness, A is area of flow, R is the hydraulic radius, and S is the channel slope.

The road pipe network infrastructure was designed to handle the 10-year rational storm event solving for Manning’s full flow capacity. The road infrastructure features drainage with conventional inlet and catch basins to assure proper flow during large storm events. Refer to the calculations in Section 3.

## **1.7 SUMMARY OF STORMWATER CALCULATIONS**

Stormwater is treated by deep sump catch basins (25% TSS removal) and semi-annual street sweeping.

To guard against possible impacts from the proposed improvements, erosion and sedimentation control measures will be incorporated into the sequence of construction. Erosion/sedimentation control installations include placement of compost filter tubes around disturbed areas and silt sacks at storm drainage inlet points. On-going stabilization of disturbed areas should be completed as the work progresses. Restoration/stabilization measures include seeding, mulching, and placement of stabilization fabric where required. The Owner is aware that the project will be subject to the United States Environmental Protection Agency (EPA) Phase II Stormwater Program for land disturbances greater than one acre. The Contractor will be required to file a NPDES Construction General Permit.

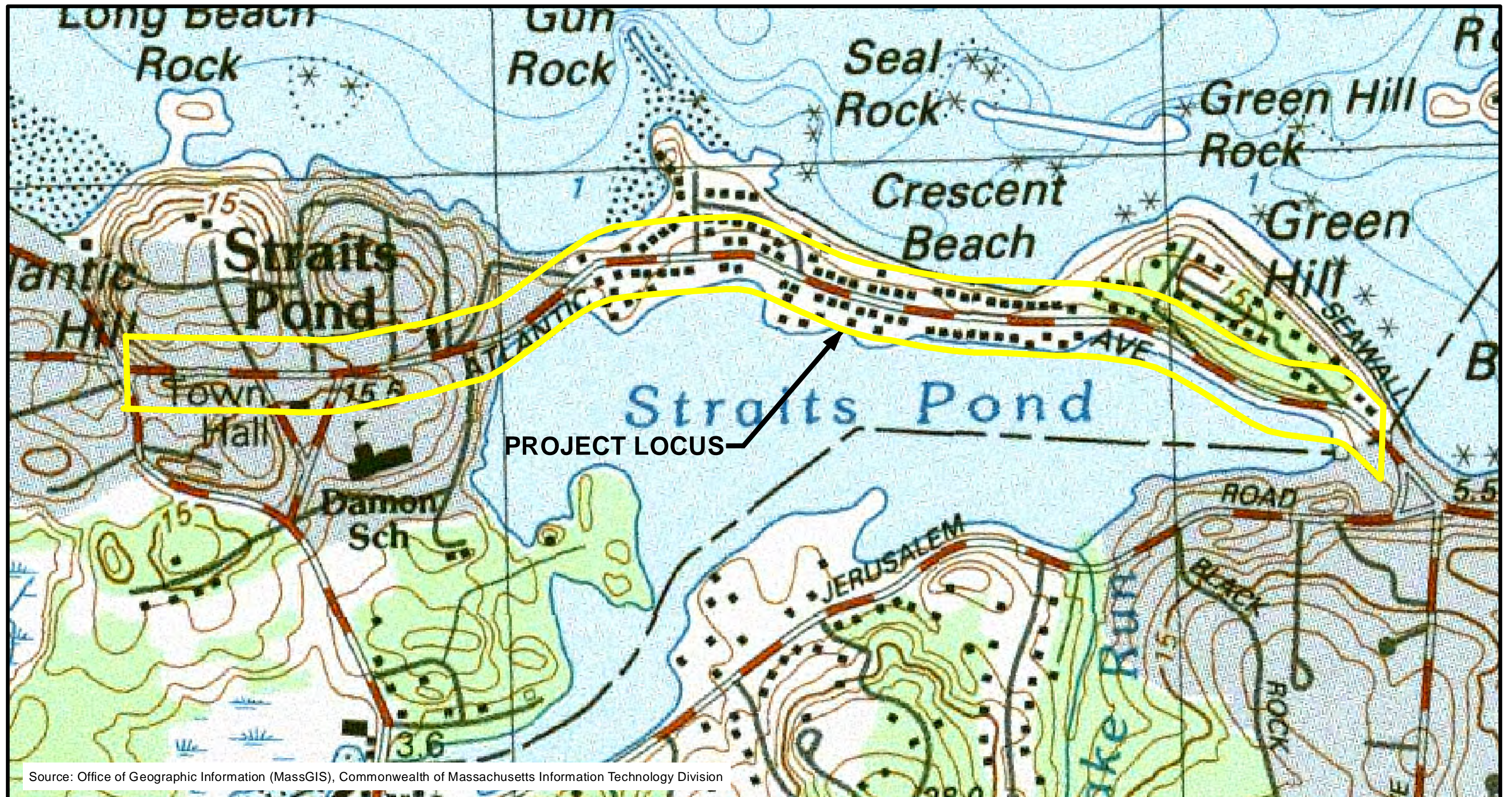
## **1.8 CONCLUSION**

In conclusion, the primary goals of the Atlantic Avenue Reconstruction project is to improve pedestrian, bicycle, and vehicular access. In addition to the improved paved surface, the Town seeks to improve drainage and improve safety along the corridor. The following calculations, Manning's full flow pipe sizing, BMP design, and associated documentation within this report have been prepared to illustrate that increases in runoff associated with the redevelopment of the site have been mitigated to the extent practicable.

## **1.9 REFERENCES**

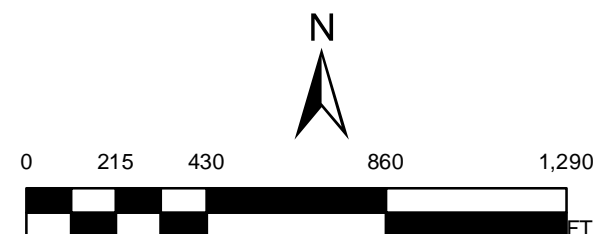
1. Commonwealth of Massachusetts, Department of Environmental Protection, Office of Coastal Zone Management. Stormwater Management Policy Handbook. Volumes 1&2, 1997 (DEP Stormwater Management Policy 1997).
2. Commonwealth of Massachusetts, Department of Environmental Protection, Stormwater Management Standards Handbook. Volumes 1-3 February 2008 (DEP Stormwater Management Policy 2008).
3. Commonwealth of Massachusetts, Department of Environmental Protection. 310 CMR 10.00: Massachusetts Wetlands Protection Act Regulations. 2008.
4. Commonwealth of Massachusetts, Department of Environmental Protection. 314 CMR 6.00: Massachusetts Groundwater Quality Standards. 1990.
5. Commonwealth of Massachusetts, Department of Environmental Protection. 314 CMR 9.00: Massachusetts Water Quality Regulations 2008.



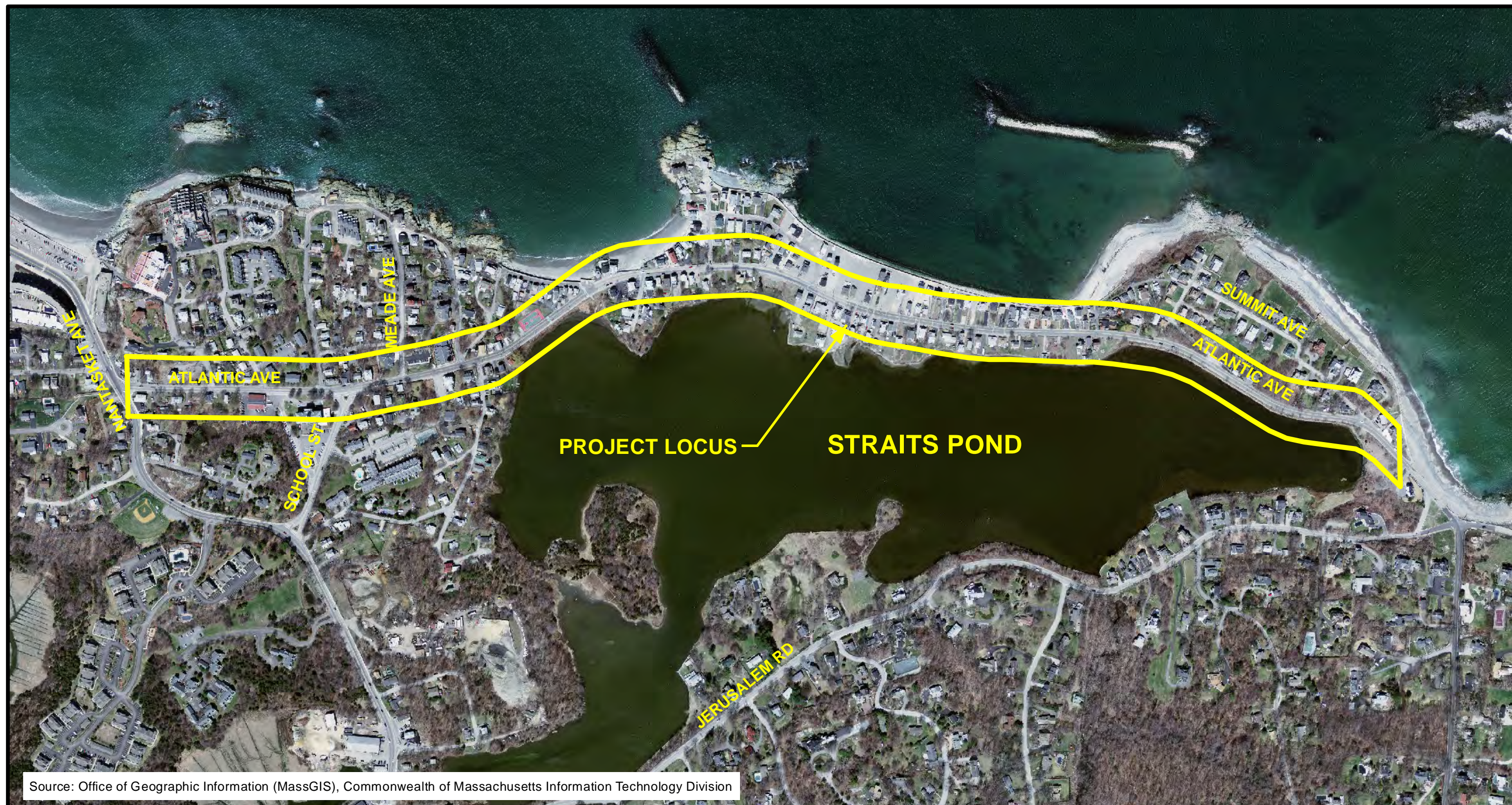


**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 1. USGS TOPOGRAPHY MAP**

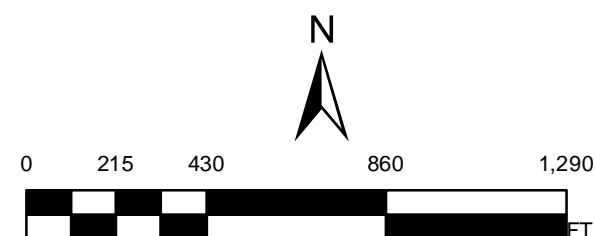






**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 2. LOCUS MAP**

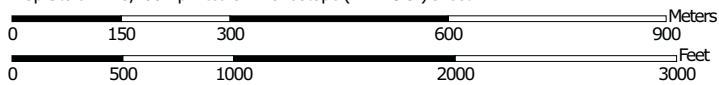




# Soil Map—Norfolk and Suffolk Counties, Massachusetts, and Plymouth County, Massachusetts



Map Scale: 1:10,400 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84




**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

10/10/2015  
Page 1 of 3

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:12,000 to 1:25,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts  
Survey Area Data: Version 10, Sep 19, 2014

Soil Survey Area: Plymouth County, Massachusetts  
Survey Area Data: Version 7, Sep 19, 2014

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—Sep 4, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



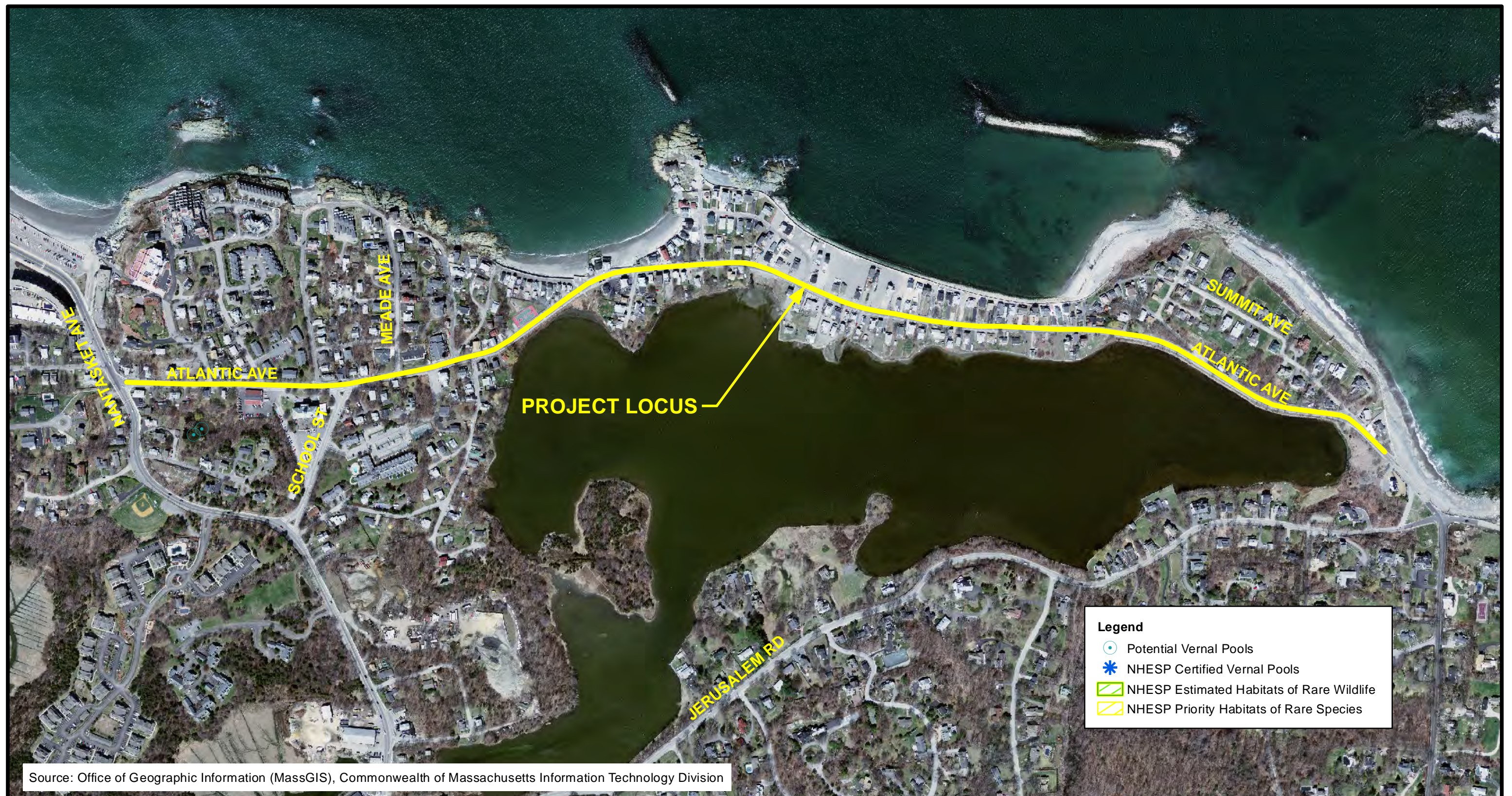
## Map Unit Legend

Norfolk and Suffolk Counties, Massachusetts (MA616)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
105D	Rock outcrop-Hollis complex, 3 to 25 percent slopes	0.1	0.8%
610	Beaches	0.1	0.9%
<b>Subtotals for Soil Survey Area</b>		<b>0.3</b>	<b>1.8%</b>
<b>Totals for Area of Interest</b>		<b>14.8</b>	<b>100.0%</b>

Plymouth County, Massachusetts (MA023)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
110C	Canton - Chatfield - Rock outcrop complex, 8 to 15 percent slopes	0.0	0.1%
110E	Canton - Chatfield - Rock outcrop complex, 15 to 35 percent slopes	1.0	6.5%
306E	Paxton loam, 15 to 35 percent slopes, very stony	2.3	15.8%
607	Water, saline	0.2	1.4%
610	Beaches, sandy	0.2	1.1%
614A	Oxyaquic Udipsamments, 0 to 3 percent slopes	0.7	4.6%
635C	Canton - Urban land - Rock outcrop complex, 3 to 15 percent slopes	6.9	46.9%
639B	Urban land - Hooksan complex, 0 to 8 percent slopes	3.2	21.9%
<b>Subtotals for Soil Survey Area</b>		<b>14.5</b>	<b>98.2%</b>
<b>Totals for Area of Interest</b>		<b>14.8</b>	<b>100.0%</b>

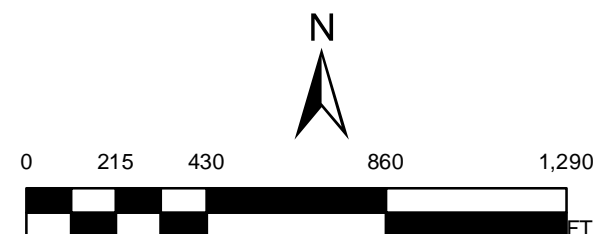




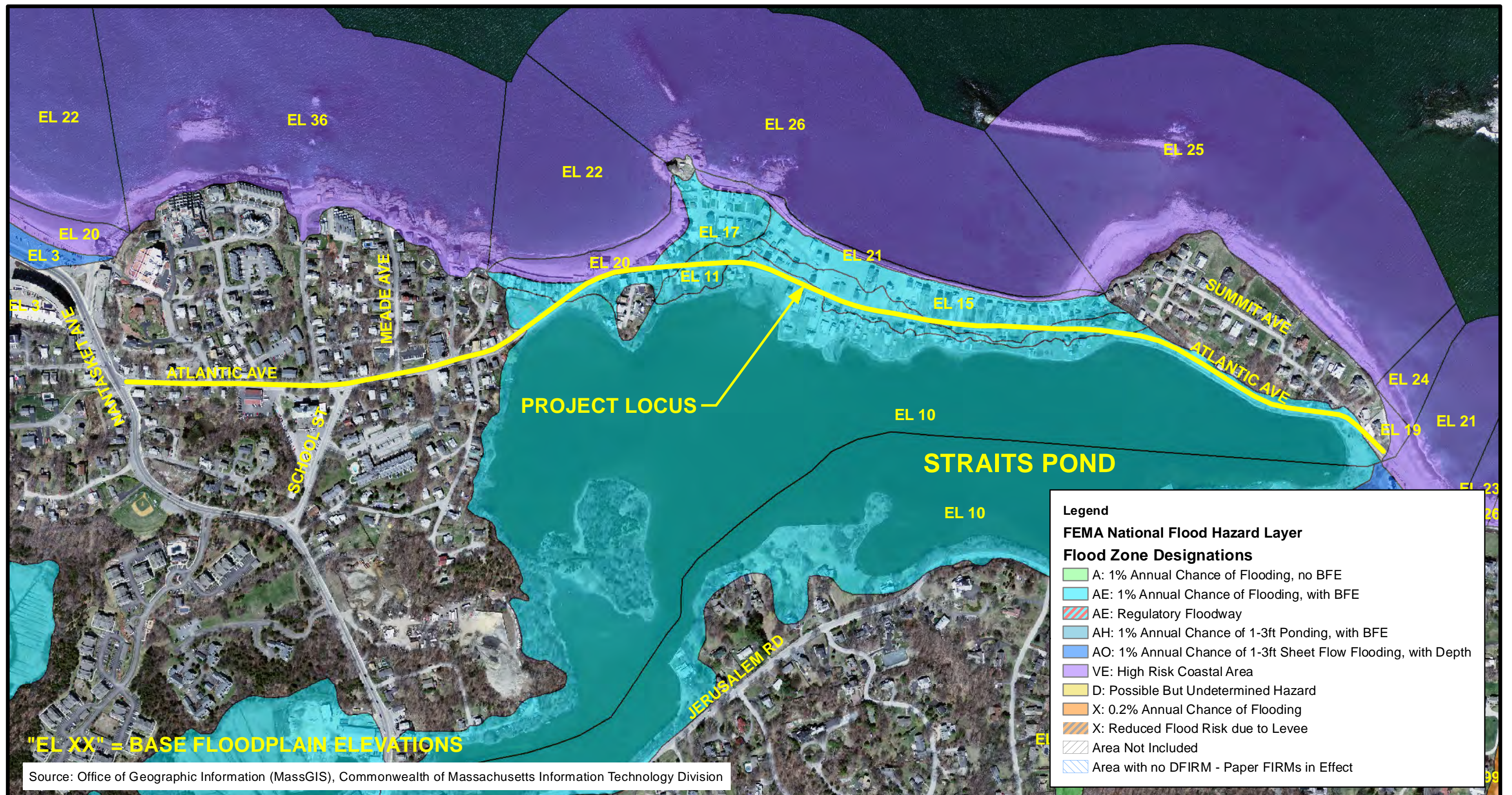


**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 3. NHESP HABITATS**

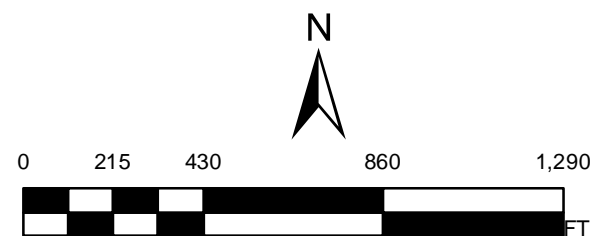




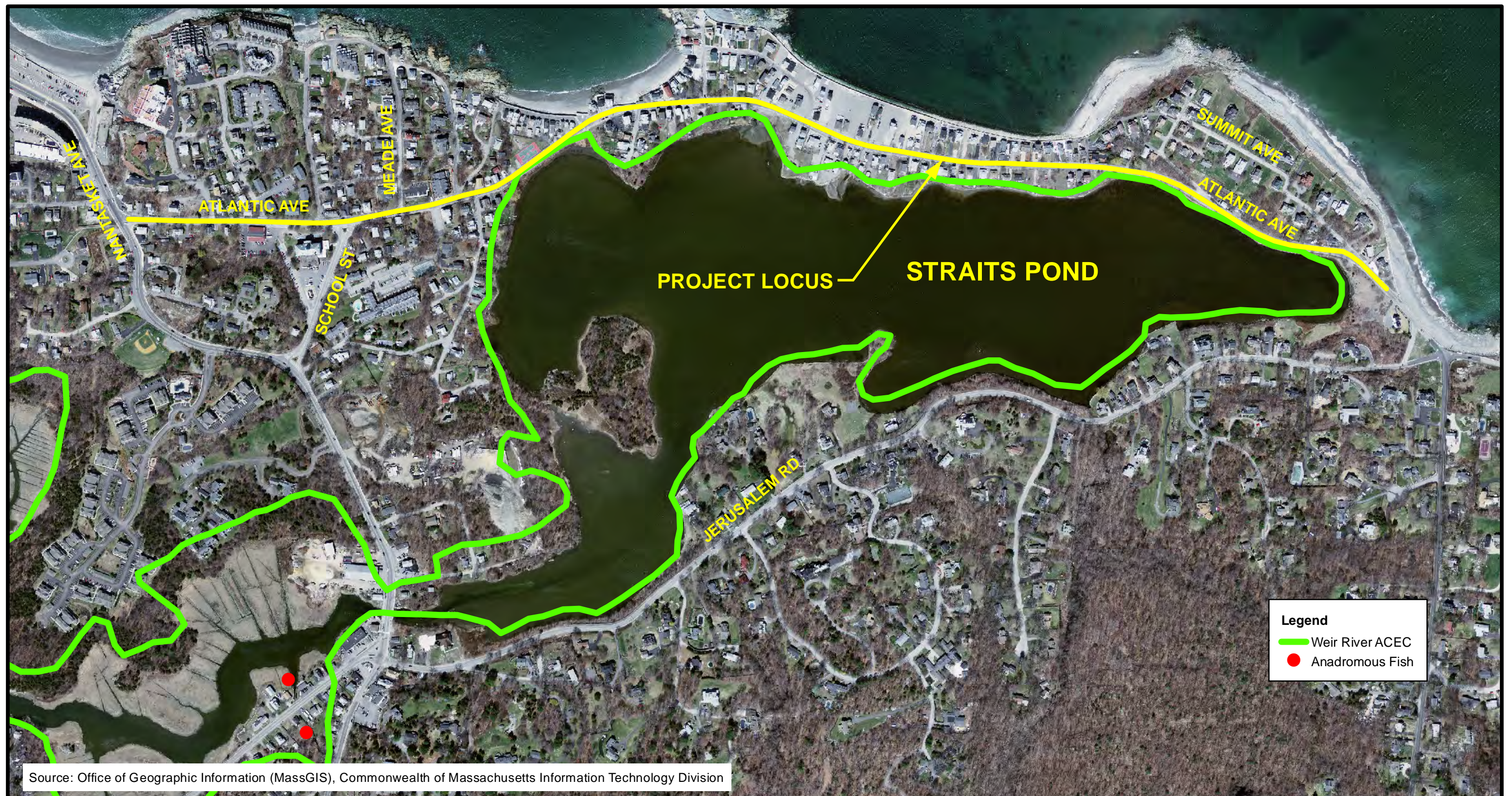


**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 4. FEMA FLOODPLAIN ZONES**

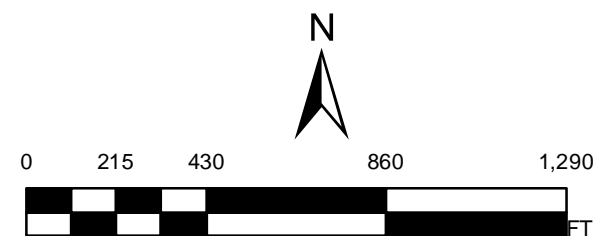






**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 5. ACEC & ANADROMOUS FISH RUN**

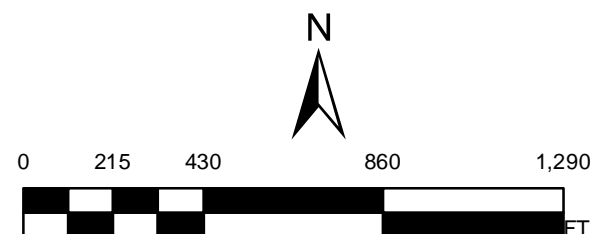




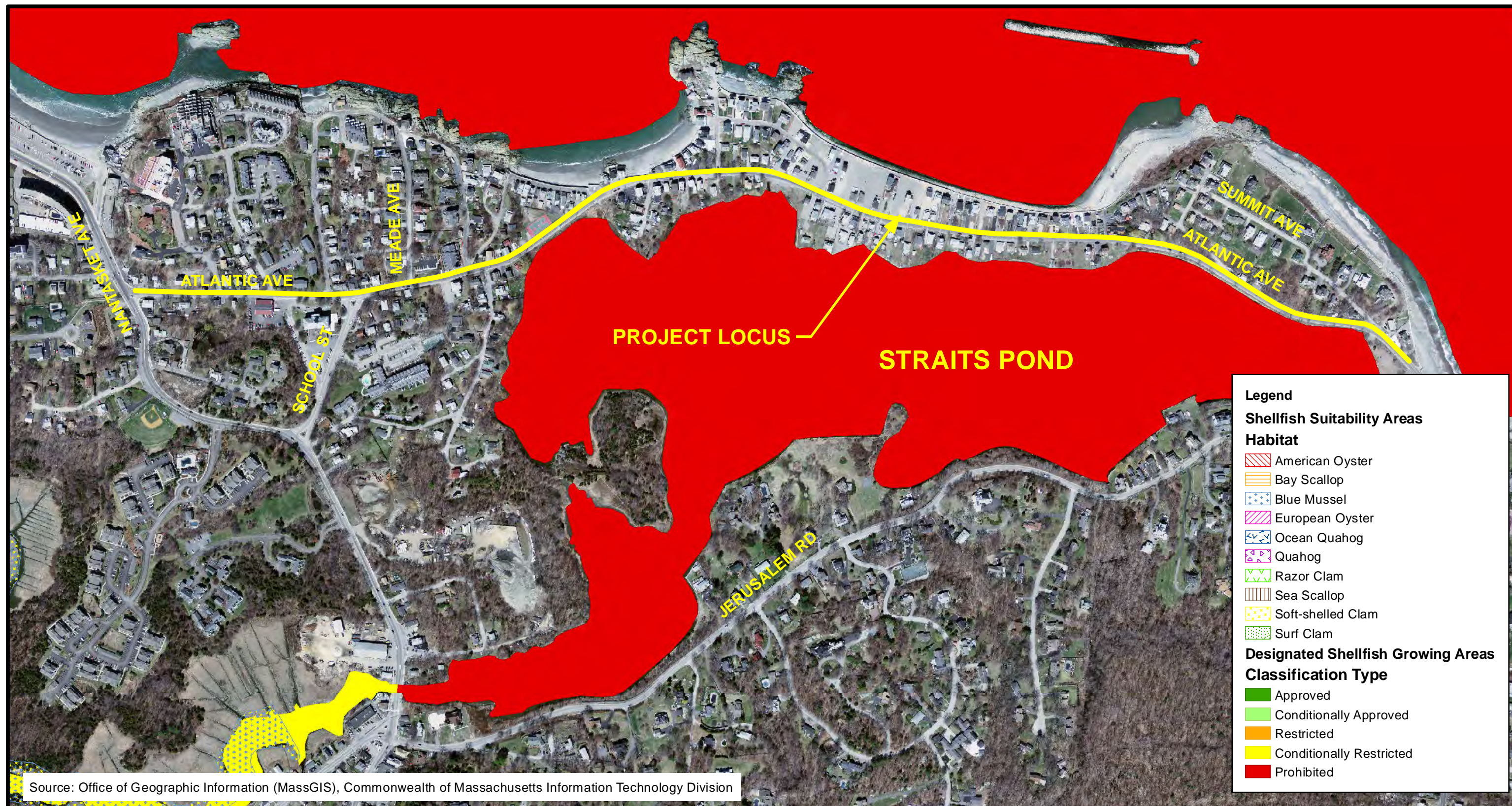


**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**Figure 6. TIDAL JURISDICTION**

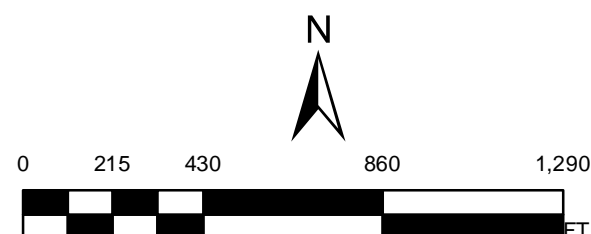






**TOWN OF HULL, MA**  
**ATLANTIC AVENUE RECONSTRUCTION**

**FIGURE 7. SHELLFISH HABITAT & GROWING AREAS**







TOWN OF HULL, MA  
 ATLANTIC AVENUE RECONSTRUCTION  
 FIGURE 8. STORMWATER OUTLET LOCATIONS



## ***Section 2***

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### ***Long-Term Pollution Prevention and Operation & Maintenance Plan***





## **RECOMMENDED LONG-TERM STORMWATER POLLUTION PREVENTION PLAN FOR ATLANTIC AVENUE**

### **OWNER AND RESPONSIBLE PARTY:**

Owner: Town of Hull

Responsible Party: Town of Hull

### **PROJECT OVERVIEW:**

The Atlantic Avenue Reconstruction Project in Hull, MA is a 1.3 mile corridor improvement project with the goal of rehabilitating the existing roadway, improving drainage, improving intersection safety, and enhancing bicycle and pedestrian accommodations. The project is needed to improve roadway conditions and safety for all roadway users along Atlantic Avenue from Nantasket Avenue to Cohasset town line. Drainage improvements and pavement rehabilitation will increase the life of the roadway. New signage and striping will increase awareness of pedestrian and bicycle users along the project corridor.

### **CONSTRUCTION MANAGEMENT:**

A construction manager with adequate knowledge and experience on projects of similar size and scope shall be employed to oversee all site work related construction. The contractor shall incorporate the appropriate techniques to control sediment and erosion pollution during construction in accordance with the *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas*. The project will be subject to the United States Environmental Protection Agency (EPA) Phase II Stormwater Program as land disturbances are greater than 1 acre of disturbance. Refer to the SWPPP prepared for additional information regarding construction related erosion & sedimentation control.

During construction, silt-laden runoff or discharge from dewatering operations (if necessary) will be prevented from entering wetlands and resource areas untreated. Siltation barriers consisting of compost filter tubes will be erected in advance of construction along the downstream edge of all disturbed areas and maintained throughout the construction period. Check dams/Compost filter tubes/Sand Bag dikes will be used in temporary constructed drainage ways as necessary to reduce erosion.

If dewatering is required during the construction, runoff will discharge through a temporary sedimentation basin and washed stone prior to discharging into vegetated areas. Outflow of silt-laden runoff shall not be permitted to flow directly into the wetlands or resource areas. Upon completion of site stabilization, the catch basins and existing conveyance system shall be thoroughly cleaned of silt and sediment and made ready for the proposed operation.

Siltation barriers, temporary sedimentation basins, and coffer dams shall be constructed and inspected by the resident project Engineer on a monthly basis or as necessary, after any significant (0.5" or more) storm event and daily while dewatering operations are proceeding.

Care should be taken when constructing stormwater control structures. Light earth-moving equipment shall be used to excavate in the vicinity of the infiltration areas. Use of heavy-equipment causes excessive compaction of the soils beneath the basin resulting in reduced infiltration capacity. At no time shall temporary infiltration areas or settling basins be constructed in the vicinity of the proposed infiltration system in order to prevent the soils from becoming clogged with sediment.

## **ON-GOING MAINTENANCE CONTRACT**

The Owner and responsible party will be required to contract with a maintenance company or hire appropriate staff to complete the following non-structural and structural approaches. The maintenance company will be required to provide adequate personnel and access to proper equipment to complete the tasks.

## **NON-STRUCTURAL APPROACHES:**

### **STREET SWEEPING**

As street sweeping is a BMP under EPA guidelines, this also satisfies other criteria in a comprehensive stormwater management program. The Town shall maintain a program of roadway sweeping to reduce sediment accumulation in the deep sump catch basins. Street sweeping will be performed on semi-annual basis (primarily in the spring and fall) to keep BMPs operating effectively. The Town must maintain an on-going agreement and plan for street sweeping.

### **GRADING**

Atlantic Avenue is an existing roadway with an existing profile that is not proposed to be modified significantly. Slopes will be permanently vegetated to dissipate energy and reduce potential erosion. No constructed vegetated slopes should exceed 2H:1V. Steep slopes may require soil reinforcement and additional vegetation. Slopes that exceed 2H:1V are proposed to be reinforced with rip rap.

### **FLOW OVER VEGETATED AREAS**

Wherever possible, runoff from paved areas and snowmelt shall be directed over vegetated areas to promote settlement of suspended solids before entering a wetland or resource area.



## SNOW STORAGE AND DEICING

Designated snow storage will be provided within the Right-of-Way. When the snow piles exceed the allotted space, the Town may load and truck the snow offsite for disposal. The snow will be placed such that melt water will be directed towards the drainage system for treatment.

## **STRUCTURAL BEST MANAGEMENT PRACTICES:**

Prior to final completion of the roadway construction a representative of the contractor and/or Engineer at the Responsible Parties request shall properly instruct the Town of the required maintenance responsibilities to maintain the effectiveness of the drainage system. These frequencies and requirements are recommendations to maintain minimum effectiveness. Ultimately, the Town will implement the procedures and frequencies as they see fit under their current plan and inspect the systems as needed to maintain minimum effectiveness.

## DEEP SUMP CATCH BASINS AND MANHOLE STRUCTURES

Catch basins shall be cleaned, in dry weather, when half of the sump capacity is filled or at a minimum of once per year or as required through periodic inspection. Cleaning will take place at the completion of construction and in early spring after sanding of roadways has ceased or as needed depending on the frequency of major storm events (> 1" of rainfall). All manholes shall be inspected at least once annually or as dictated by the responsible party. Any obstructions, sediment, and debris that could potentially cause clogs shall be removed within the conveyance system as necessary. Inverts, grates, and hoods shall be checked and replaced as necessary to maintain hydraulic effectiveness.



## LONG TERM STRUCTURAL BEST MANAGEMENT PRACTICE INSPECTION & MAINTENANCE MATRIX AFTER CONSTRUCTION

Note: BMP's shall be visually inspected and repaired by a qualified party in accordance with the following chart. Note these are minimum inspection criteria/frequencies and should be adjusted throughout the project lifespan as required to maintain effectiveness. Refer to maintenance standards for drainage facilities and structural best management practices in the "Recommended Long-Term Stormwater Pollution Prevention Plan."

Conventional & LID Best Management Practices	Recommended Minimum Inspection & Maintenance Frequency	Erosion/Scouring	Tree Growth Hazards	Differential Settlement/Seepage	Structural Damage/Obstructions	Trash & Debris	Removal of Accumulated Sediment	Slope Integrity	*Mow Vegetation/Poor Vegetation Coverage	Remove/Reset Filter Fabric & Stone As Required	Remove & Replace Hardwood mulch/media	Vac Truck Sediment & Contaminants	Remove/Reset Riprap as Required
Deep Sump Catch Basin	Annually		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	





## ***Section 3***

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### ***Hydraulic Calculations***





## STORMWATER REPORT - HYDRAULIC CALCULATIONS

		Manhole Location		Discharge				Pipe Data						Vertical Control			
		Structures		Drainage Area (Acres)	Coefficient	Tc (Min)	I (In./Hr)	Design Discharge		Slope (%)	Diameter (in)	Full-Flow Capacity (cfs)	Full-Flow Velocity (fps)	Invert Elevation		Top of MH Elevation	
System #	Street Name	From Inlet	To Outlet					(cfs)	Length (ft)					Upper	Lower	Upper	Lower
1	Atlantic Ave	EXIST-CB-1	EXIST-DMH-1	0.00	0.9	5	5.8	1.43	20.3	1.0	12.0	3.62	4.35	20.17	19.96	22.82	14.83
1	Atlantic Ave	EXIST-DMH-1	EXIST-DMH-2	0.00	0.9	5	5.8	1.43	53.8	3.8	12.0	6.94	6.97	17.56	15.52	14.83	11.46
1	Atlantic Ave	EXIST-DMH-2	OUTFALL	0.00	0.9	5	5.8	1.43	15.7	6.2	12.0	8.86	8.29	13.97	13.00	11.46	OUTFALL
1	Atlantic Ave	PROP-CB-1	PROP-DMH-1	0.08	0.9	5	5.8	0.42	23.4	5.1	12.0	8.03	5.41	40.09	38.90	43.59	42.90
1	Atlantic Ave	PROP-CB-2	PROP-DMH-1	0.11	0.9	5	5.8	0.57	12.4	6.8	12.0	9.29	6.56	39.74	38.90	43.74	42.90
1	Atlantic Ave	PROP-CB-72	PROP-CIT-10	0.09	0.9	5	5.8	0.49	30.3	5.2	12.0	8.09	5.70	22.34	20.78	25.84	23.98
1	Atlantic Ave	PROP-CIT-10	EXIST-CB-1	0.00	0.9	5	5.8	0.49	34.4	1.4	12.0	4.21	3.60	20.70	20.22	23.98	22.82
1	Atlantic Ave	PROP-DMH-1	PROP-DMH-2	0.00	0.9	5	5.8	0.98	176.7	7.3	12.0	9.60	7.96	33.80	20.96	42.90	25.08
1	Atlantic Ave	PROP-DMH-2	EXIST-CB-1	0.00	0.9	5	5.8	0.97	76.9	5.8	12.0	3.23	3.63	20.80	16.37	25.08	22.82
2	Atlantic Ave	PROP-CB-3	PROP-DMH-3	0.08	0.9	5	5.8	0.41	19.4	0.1	10.0	1.27	2.42	49.54	49.52	52.04	52.19
2	Atlantic Ave	PROP-CB-4	PROP-CIT-1	0.10	0.9	5	5.8	0.52	16.7	0.2	12.0	2.07	2.43	49.42	49.39	51.92	52.01
2	Atlantic Ave	PROP-CB-5	PROP-DMH-4	0.08	0.9	5	5.8	0.41	20.1	2.0	12.0	5.02	3.87	51.62	51.22	55.12	55.12
2	Atlantic Ave	PROP-CB-6	PROP-DMH-4	0.08	0.9	5	5.8	0.40	13.8	2.9	12.0	6.07	4.35	51.62	51.22	55.12	55.12
2	Atlantic Ave	PROP-CB-73	PROP-DMH-3	0.02	0.9	5	5.8	0.11	46.5	0.2	10.0	1.32	2.38	49.62	49.52	51.98	52.19
2	Atlantic Ave	PROP-CIT-1	OUTFALL	0.00	0.9	5	5.8	1.77	92.5	2.9	8.0	2.68	8.23	49.39	46.70	52.01	OUTFALL
2	Atlantic Ave	PROP-DMH-3	PROP-CIT-1	0.00	0.9	5	5.8	1.28	8.8	0.9	12.0	2.94	3.61	49.47	49.39	52.19	52.01
2	Atlantic Ave	PROP-DMH-4	PROP-DMH-3	0.00	0.9	5	5.8	0.78	171.9	0.9	12.0	3.44	4.51	51.12	49.52	55.12	52.19
3	Atlantic Ave	EXIST-CB-2	EXIST-DMH-3	0.01	0.9	5	5.8	0.03	22.3	5.4	10.0	6.59	3.13	34.01	32.82	36.91	37.17
3	Atlantic Ave	EXIST-CB-3	PROP-CIT-2	0.03	0.9	5	5.8	0.14	41.8	9.9	8.0	3.79	6.15	25.27	21.15	27.72	23.67
3	Atlantic Ave	EXIST-CB-4	PROP-CIT-4	0.07	0.9	5	5.8	0.38	29.4	1.4	12.0	4.16	3.79	11.95	11.55	15.30	15.09
3	Atlantic Ave	EXIST-DMH-3	PROP-DMH-8	0.00	0.9	5	5.8	0.03	18.8	18.3	12.0	15.24	3.92	32.82	29.39	37.17	33.68
3	Atlantic Ave	PROP-CB-10	PROP-DMH-7	0.10	0.9	5	5.8	0.53	22.7	0.9	12.0	3.35	3.40	35.36	35.16	38.86	39.06
3	Atlantic Ave	PROP-CB-11	PROP-DMH-7	0.14	0.9	5	5.8	0.73	8.5	1.3	12.0	4.06	3.92	34.31	34.20	38.81	39.06
3	Atlantic Ave	PROP-CB-12	PROP-DMH-9	0.16	0.9	5	5.8	0.85	8.3	0.5	12.0	2.47	2.86	22.28	22.24	26.78	26.71
3	Atlantic Ave	PROP-CB-13	PROP-DMH-8	0.10	0.9	5	5.8	0.49	39.9	0.9	12.0	3.34	3.87	29.74	29.39	33.24	33.68
3	Atlantic Ave	PROP-CB-14	PROP-DMH-9	0.07	0.9	5	5.8	0.38	25.2	1.6	12.0	4.54	3.83	23.22	22.81	26.72	26.71
3	Atlantic Ave	PROP-CB-15	PROP-CIT-3	0.05	0.9	5	5.8	0.24	36.6	2.2	12.0	5.30	4.28	19.32	18.51	23.50	22.05
3	Atlantic Ave	PROP-CB-16	PROP-CIT-4	0.08	0.9	5	5.8	0.40	7.1	0.4	12.0	2.32	2.22	11.88	11.85	15.38	15.09
3	Atlantic Ave	PROP-CB-17	PROP-DMH-14	0.11	0.9	5	5.8	0.56	20.1	0.5	12.0	2.38	2.69	4.25	4.16	8.50	8.71
3	Atlantic Ave	PROP-CB-18	PROP-CIT-5	0.14	0.9	5	5.8	0.74	6.4	1.6	12.0	4.44	4.19	4.95	4.85	8.45	8.52
3	Atlantic Ave	PROP-CB-19	PROP-DMH-15	0.05	0.9	5	5.8	0.28	19.8	0.5	12.0	2.53	2.54	4.35	4.25	8.56	8.74
3	Atlantic Ave	PROP-CB-20	PROP-DMH-15	0.08	0.9	5	5.8	0.43	14.3	0.4	12.0	2.31	2.37	5.02	4.96	8.52	8.74
3	Atlantic Ave	PROP-CB-21	PROP-DMH-16	0.14	0.9	5	5.8	0.74	13.6	3.3	12.0	6.48	5.49	7.62	7.17	11.12	11.17
3	Atlantic Ave	PROP-CB-22	PROP-DMH-16	0.12	0.9	5	5.8	0.61	20.5	3.7	12.0	6.86	5.42	7.93	7.17	11.43	11.17
3	Atlantic Ave	PROP-CB-7	PROP-DMH-5	0.05	0.9	5	5.8	0.24	14.5	3.7	12.0	6.88	4.11	51.93	51.39	55.43	55.39
3	Atlantic Ave	PROP-CB-74	PROP-DMH-6	0.18	0.9	5	5.8	0.96	14.1	5.9	12.0	8.65	7.26	43.26	42.43	46.76	46.53
3	Atlantic Ave	PROP-CB-8	PROP-DMH-5	0.06	0.9	5	5.8	0.31	23.4	2.4	12.0	5.51	3.95	51.95	51.39	55.45	55.39
3	Atlantic Ave	PROP-CB-9	PROP-DMH-6	0.14	0.9	5	5.8	0.71	22.6	2.8	12.0	6.00	5.14	43.27	42.63	46.77	46.53
3	Atlantic Ave	PROP-CIT-2	PROP-DMH-10	0.00	0.9	5	5.8	0.14	10.2	3.8	10.0	5.57	4.17	21.05	20.66	23.67	23.41
3	Atlantic Ave	PROP-CIT-3	PROP-CIT-4	0.00	0.9	5	5.8	5.23	128.8	5.4	12.0	8.28	11.20	18.41	11.45	22.05	15.09
3	Atlantic Ave	PROP-CIT-4	PROP-CIT-5	0.00	0.9	5	5.8	5.86	235.6	3.0	15.0	11.20	9.36	11.35	4.27	15.09	8.52
3	Atlantic Ave	PROP-CIT-5	OUTFALL	0.00	0.9	5	5.8	8.77	17.3	1.7	18.0	13.85	8.29	3.30	3.00	8.52	OUTFALL
3	Atlantic Ave	PROP-DMH-10	PROP-CIT-3	0.00	0.9	5	5.8	5.02	30.8	2.6	12.0	5.74	8.25	19.31	18.51	23.41	22.05
3	Atlantic Ave	PROP-DMH-14	PROP-CIT-5	0.00	0.9	5	5.8	2.55	15.4	2.7	12.0	5.82	7.17	3.94	3.53	8.71	8.52
3	Atlantic Ave	PROP-DMH-15	PROP-DMH-14	0.00	0.9	5	5.8	2.01	25.1	0.4	12.0	2.36	3.39	4.15	4.04	8.74	8.71

## STORMWATER REPORT - HYDRAULIC CALCULATIONS

		Manhole Location		Discharge				Pipe Data					Vertical Control				
		Structures		Drainage Area (Acres)	Coefficient	Tc (Min)	I (In./Hr)	Design Discharge		Slope (%)	Diameter (in)	Full-Flow Capacity (cfs)	Full-Flow Velocity (fps)	Invert Elevation		Top of MH Elevation	
System #	Street Name	From Inlet	To Outlet					(cfs)	Length (ft)					Upper	Lower	Upper	Lower
3	Atlantic Ave	PROP-DMH-16	PROP-DMH-15	0.00	0.9	5	5.8	1.32	137.2	1.9	12.0	4.96	5.52	7.07	4.41	11.17	8.74
3	Atlantic Ave	PROP-DMH-5	PROP-DMH-6	0.00	0.9	5	5.8	0.53	294.4	3.0	12.0	6.15	6.56	51.29	42.53	55.39	46.53
3	Atlantic Ave	PROP-DMH-6	PROP-DMH-7	0.00	0.9	5	5.8	2.11	195.6	3.8	12.0	6.92	7.81	42.43	35.06	46.53	39.06
3	Atlantic Ave	PROP-DMH-7	PROP-DMH-8	0.00	0.9	5	5.8	3.29	126.6	3.8	12.0	6.94	8.77	34.10	29.29	39.06	33.68
3	Atlantic Ave	PROP-DMH-8	PROP-DMH-9	0.00	0.9	5	5.8	3.78	146.5	4.8	12.0	7.81	9.92	29.19	22.14	33.68	26.71
3	Atlantic Ave	PROP-DMH-9	PROP-DMH-10	0.00	0.9	5	5.8	4.89	64.3	4.1	12.0	7.20	9.87	22.04	19.41	26.71	23.41
4	Atlantic Ave	PROP-CB-23	PROP-DMH-17	0.12	0.9	5	5.8	0.63	12.2	0.7	12.0	3.07	3.07	9.39	9.30	13.89	14.06
4	Atlantic Ave	PROP-CB-24	PROP-DMH-17	0.11	0.9	5	5.8	0.57	21.2	0.8	12.0	3.19	3.19	9.47	9.30	13.97	14.06
4	Atlantic Ave	PROP-CB-25	PROP-DMH-18	0.16	0.9	5	5.8	0.84	11.0	1.1	12.0	3.72	3.83	4.68	4.56	8.18	8.42
4	Atlantic Ave	PROP-CB-26	PROP-DMH-19	0.10	0.9	5	5.8	0.50	42.7	2.5	12.0	5.59	5.17	5.35	4.30	8.85	8.26
4	Atlantic Ave	PROP-CB-27	PROP-DMH-19	0.03	0.9	5	5.8	0.17	7.8	1.5	12.0	4.43	2.71	3.97	3.85	8.47	8.26
4	Atlantic Ave	PROP-CB-28	PROP-DMH-20	0.09	0.9	5	5.8	0.45	12.5	0.8	12.0	4.14	3.45	2.95	2.85	5.95	6.03
4	Atlantic Ave	PROP-CB-29	PROP-DMH-20	0.06	0.9	5	5.8	0.29	20.1	1.0	12.0	4.62	3.58	3.05	2.85	6.01	6.03
4	Atlantic Ave	PROP-CB-30	PROP-DMH-22	0.09	0.9	5	5.8	0.48	12.1	0.3	10.0	1.64	2.62	2.41	2.37	4.81	5.05
4	Atlantic Ave	PROP-CB-31	PROP-DMH-22	0.06	0.9	5	5.8	0.33	20.6	0.4	10.0	1.77	2.81	2.45	2.37	4.87	5.05
4	Atlantic Ave	PROP-CB-32	PROP-DMH-23	0.07	0.9	5	5.8	0.35	12.1	0.2	10.0	1.27	2.08	2.50	2.48	4.83	5.07
4	Atlantic Ave	PROP-CB-33	PROP-DMH-23	0.05	0.9	5	5.8	0.25	20.6	0.4	10.0	1.77	2.73	2.56	2.48	4.89	5.07
4	Atlantic Ave	PROP-CB-34	PROP-DMH-24	0.11	0.9	5	5.8	0.59	12.1	0.3	10.0	1.64	2.76	2.99	2.95	5.40	5.61
4	Atlantic Ave	PROP-CB-35	PROP-DMH-24	0.10	0.9	5	5.8	0.49	21.4	0.4	10.0	1.74	3.04	3.03	2.95	5.48	5.61
4	Atlantic Ave	PROP-DMH-17	PROP-DMH-18	0.00	0.9	5	5.8	1.12	300.1	1.6	12.0	4.50	6.38	9.20	4.42	14.06	8.42
4	Atlantic Ave	PROP-DMH-18	PROP-DMH-20	0.00	0.9	5	5.8	2.46	165.2	0.5	12.0	2.59	3.92	3.56	2.69	8.42	6.03
4	Atlantic Ave	PROP-DMH-19	PROP-DMH-18	0.00	0.9	5	5.8	0.66	21.1	0.4	12.0	2.33	2.56	3.75	3.66	8.26	8.42
4	Atlantic Ave	PROP-DMH-20	PROP-DMH-21	0.00	0.9	5	5.8	3.07	80.7	0.7	12.0	3.86	5.49	2.59	2.03	6.03	5.33
4	Atlantic Ave	PROP-DMH-21	OUTFALL	0.00	0.9	5	5.8	5.38	32.2	0.5	15.0	5.73	5.32	1.95	1.80	5.33	OUTFALL
4	Atlantic Ave	PROP-DMH-22	PROP-DMH-21	0.00	0.9	5	5.8	2.37	77.7	0.4	12.0	2.83	4.09	2.32	2.03	5.05	5.33
4	Atlantic Ave	PROP-DMH-23	PROP-DMH-22	0.00	0.9	5	5.8	1.61	20.3	0.3	12.0	2.52	3.40	2.43	2.37	5.07	5.05
4	Atlantic Ave	PROP-DMH-24	PROP-DMH-23	0.00	0.9	5	5.8	1.04	115.0	0.4	12.0	2.28	3.17	2.95	2.48	5.61	5.07
5	Atlantic Ave	PROP-CB-36	PROP-DMH-25	0.09	0.9	5	5.8	0.45	5.5	0.5	10.0	2.10	3.06	2.78	2.75	5.78	5.80
5	Atlantic Ave	PROP-CB-37	PROP-DMH-25	0.06	0.9	5	5.8	0.29	30.9	1.9	10.0	3.93	4.79	2.84	2.25	5.84	5.80
5	Atlantic Ave	PROP-CB-38	PROP-DMH-26	0.11	0.9	5	5.8	0.57	11.1	4.2	10.0	5.80	6.78	2.81	2.35	5.81	6.05
5	Atlantic Ave	PROP-CB-39	PROP-DMH-26	0.07	0.9	5	5.8	0.35	20.0	2.6	10.0	4.59	4.98	2.87	2.35	5.87	6.05
5	Atlantic Ave	PROP-CB-40	PROP-DMH-27	0.16	0.9	5	5.8	0.83	12.1	1.7	12.0	4.59	4.43	3.75	3.55	7.25	7.45
5	Atlantic Ave	PROP-CB-41	PROP-DMH-27	0.11	0.9	5	5.8	0.56	20.6	1.3	12.0	4.08	3.65	3.82	3.55	7.32	7.45
5	Atlantic Ave	PROP-CB-42	PROP-DMH-28	0.10	0.9	5	5.8	0.54	14.6	2.2	12.0	5.28	4.34	5.99	5.67	9.49	9.67
5	Atlantic Ave	PROP-CB-43	PROP-DMH-28	0.06	0.9	5	5.8	0.32	27.2	1.6	12.0	4.53	3.78	6.11	5.67	9.61	9.67
5	Atlantic Ave	PROP-DMH-25	OUTFALL	0.00	0.9	5	5.8	3.39	145.4	0.5	12.0	3.41	5.10	2.01	1.22	5.80	OUTFALL
5	Atlantic Ave	PROP-DMH-26	PROP-DMH-25	0.00	0.9	5	5.8	2.75	25.9	0.7	12.0	3.97	5.46	2.25	2.06	6.05	5.80
5	Atlantic Ave	PROP-DMH-27	PROP-DMH-26	0.00	0.9	5	5.8	1.98	177.1	0.6	12.0	2.68	3.85	3.35	2.35	7.45	6.05
5	Atlantic Ave	PROP-DMH-28	PROP-DMH-27	0.00	0.9	5	5.8	0.78	288.6	0.7	12.0	3.05	5.06	5.57	3.45	9.67	7.45
6	Atlantic Ave	PROP-CB-44	PROP-DMH-29	0.07	0.9	5	5.8	0.38	8.6	1.7	12.0	4.70	3.61	6.08	5.93	9.58	9.62
6	Atlantic Ave	PROP-CB-45	PROP-DMH-29	0.05	0.9	5	5.8	0.27	26.7	2.7	10.0	4.65	4.95	6.83	6.12	9.58	9.62
6	Atlantic Ave	PROP-CB-46	PROP-DMH-30	0.07	0.9	5	5.8	0.37	26.5	0.9	10.0	2.77	3.89	4.53	4.28	7.28	7.07
6	Atlantic Ave	PROP-CB-47	PROP-DMH-31	0.02	0.9	5	5.8	0.11	20.2	1.5	10.0	3.47	3.31	4.34	4.04	7.09	6.67
6	Atlantic Ave	PROP-CB-48	PROP-DMH-31	0.15	0.9	5	5.8	0.76	9.8	0.3	10.0	1.57	2.87	4.07	4.04	6.41	6.67
6	Atlantic Ave	PROP-CB-49	PROP-DMH-32	0.02	0.9	5	5.8	0.08	24.3	1.6	10.0	3.56	3.27	3.78	3.40	6.53	6.16

## STORMWATER REPORT - HYDRAULIC CALCULATIONS

		Manhole Location		Discharge				Pipe Data				Vertical Control					
		Structures		Drainage Area (Acres)	Coefficient	Tc (Min)	I (In./Hr)	Design Discharge (cfs)	Length (ft)	Slope (%)	Diameter (in)	Full-Flow Capacity (cfs)	Full-Flow Velocity (fps)	Invert Elevation		Top of MH Elevation	
System #	Street Name	From Inlet	To Outlet											Upper	Lower	Upper	Lower
6	Atlantic Ave	PROP-CB-50	PROP-DMH-32	0.10	0.9	5	5.8	0.51	10.3	0.4	10.0	1.78	2.82	3.44	3.40	5.94	6.16
6	Atlantic Ave	PROP-CB-51	PROP-DMH-33	0.16	0.9	5	5.8	0.84	10.4	2.0	10.0	4.05	5.86	3.46	3.25	5.96	6.19
6	Atlantic Ave	PROP-CB-52	PROP-DMH-33	0.03	0.9	5	5.8	0.15	24.5	2.2	10.0	4.23	4.12	3.79	3.25	6.54	6.19
6	Atlantic Ave	PROP-DMH-29	PROP-DMH-30	0.00	0.9	5	5.8	0.62	209.5	0.6	12.0	3.70	4.91	5.62	4.28	9.62	7.07
6	Atlantic Ave	PROP-DMH-30	PROP-DMH-31	0.00	0.9	5	5.8	0.96	52.2	0.4	12.0	2.79	3.24	4.23	4.04	7.07	6.67
6	Atlantic Ave	PROP-DMH-31	PROP-DMH-32	0.00	0.9	5	5.8	1.74	141.0	0.4	12.0	2.30	3.32	3.99	3.40	6.67	6.16
6	Atlantic Ave	PROP-DMH-32	PROP-DMH-33	0.00	0.9	5	5.8	2.24	19.9	0.5	12.0	3.28	4.49	3.35	3.25	6.16	6.19
6	Atlantic Ave	PROP-DMH-33	PROP-DMH-34	0.00	0.9	5	5.8	3.11	31.9	0.5	12.0	3.38	4.89	3.20	3.03	6.19	6.58
6	Atlantic Ave	PROP-DMH-34	OUTFALL	0.00	0.9	5	5.8	3.11	17.6	2.2	12.0	5.23	6.95	2.98	2.60	6.58	OUTFALL
7	Atlantic Ave	PROP-CB-53	PROP-DMH-36	0.09	0.9	5	5.8	0.44	20.6	0.5	12.0	3.23	3.13	3.28	3.18	6.28	7.08
7	Atlantic Ave	PROP-CB-54	PROP-DMH-37	0.08	0.9	5	5.8	0.39	20.6	0.3	12.0	2.50	2.67	3.37	3.31	6.37	7.14
7	Atlantic Ave	PROP-CB-55	PROP-DMH-36	0.02	0.9	5	5.8	0.11	9.5	2.1	12.0	6.73	3.18	3.75	3.55	7.25	7.08
7	Atlantic Ave	PROP-CB-56	PROP-DMH-37	0.03	0.9	5	5.8	0.15	9.2	6.4	12.0	11.72	5.22	3.83	3.24	7.33	7.14
7	Atlantic Ave	PROP-CB-57	PROP-DMH-38	0.01	0.9	5	5.8	0.04	25.6	8.7	12.0	13.69	3.85	6.61	4.37	9.61	7.37
7	Atlantic Ave	PROP-CB-58	PROP-DMH-38	0.01	0.9	5	5.8	0.08	31.4	2.0	12.0	6.61	3.45	5.01	4.37	6.28	7.37
7	Atlantic Ave	PROP-DMH-35	OUTFALL	0.00	0.9	5	5.8	1.20	17.6	0.9	12.0	3.29	3.86	2.85	2.70	6.39	OUTFALL
7	Atlantic Ave	PROP-DMH-36	PROP-DMH-35	0.00	0.9	5	5.8	1.20	28.5	0.5	12.0	3.13	3.73	3.08	2.95	7.08	6.39
7	Atlantic Ave	PROP-DMH-37	PROP-DMH-36	0.00	0.9	5	5.8	0.66	20.3	0.3	12.0	2.52	2.70	3.24	3.18	7.14	7.08
7	Atlantic Ave	PROP-DMH-38	PROP-DMH-37	0.00	0.9	5	5.8	0.11	52.9	1.9	12.0	6.30	3.09	4.37	3.39	7.37	7.14
8	Atlantic Ave	PROP-CB-59	PROP-DMH-39	0.10	0.9	5	5.8	0.50	19.0	0.2	10.0	1.31	2.49	3.59	3.55	6.09	6.07
8	Atlantic Ave	PROP-CB-60	PROP-DMH-39	0.01	0.9	5	5.8	0.07	11.0	0.5	10.0	1.92	1.99	3.55	3.50	6.05	6.07
8	Atlantic Ave	PROP-CB-61	PROP-DMH-40	0.07	0.9	5	5.8	0.38	12.6	1.1	10.0	3.01	3.78	3.59	3.45	6.09	6.08
8	Atlantic Ave	PROP-CB-62	PROP-DMH-41	0.10	0.9	5	5.8	0.52	22.4	0.4	10.0	1.59	2.94	3.07	2.99	5.40	6.30
8	Atlantic Ave	PROP-CB-63	PROP-DMH-41	0.04	0.9	5	5.8	0.20	25.1	0.4	10.0	1.61	2.58	3.08	2.99	5.58	6.30
8	Atlantic Ave	PROP-DMH-39	PROP-DMH-40	0.00	0.9	5	5.8	0.57	17.4	3.0	10.0	4.93	6.03	3.50	2.98	6.07	6.08
8	Atlantic Ave	PROP-DMH-40	OUTFALL	0.00	0.9	5	5.8	1.63	19.9	0.6	12.0	3.45	4.33	2.68	2.57	6.08	OUTFALL
8	Atlantic Ave	PROP-DMH-41	PROP-DMH-40	0.00	0.9	5	5.8	0.71	62.3	0.4	12.0	2.75	2.97	3.00	2.78	6.30	6.08
9	Atlantic Ave	PROP-CB-64	PROP-DMH-42	0.11	0.9	5	5.8	0.59	29.5	4.3	10.0	5.91	6.96	3.59	2.32	4.87	4.94
9	Atlantic Ave	PROP-CB-65	PROP-DMH-42	0.04	0.9	5	5.8	0.20	20.5	0.5	10.0	1.99	2.76	2.54	2.44	4.98	4.94
9	Atlantic Ave	PROP-CB-66	PROP-DMH-42	0.05	0.9	5	5.8	0.28	21.6	0.3	10.0	1.50	2.59	2.47	2.41	4.80	4.94
9	Atlantic Ave	PROP-CB-67	PROP-DMH-42	0.15	0.9	5	5.8	0.80	9.4	0.2	10.0	1.31	2.53	2.41	2.39	4.74	4.94
9	Atlantic Ave	PROP-DMH-42	PROP-DMH-43	0.00	0.9	5	5.8	1.86	42.0	0.4	12.0	2.77	3.80	2.32	2.17	4.94	5.05
9	Atlantic Ave	PROP-DMH-43	OUTFALL	0.00	0.9	5	5.8	1.85	21.0	0.4	12.0	2.86	3.88	2.17	2.09	5.05	OUTFALL
10	Atlantic Ave	EXIST-CB-5	PROP-CIT-6	0.01	0.9	5	5.8	0.06	24.2	1.5	10.0	2.71	2.63	7.21	6.84	9.56	9.39
10	Atlantic Ave	PROP-CB-68	PROP-DMH-45	0.17	0.9	5	5.8	0.89	10.5	1.0	12.0	3.47	3.71	4.52	4.42	8.02	8.32
10	Atlantic Ave	PROP-CB-69	PROP-DMH-45	0.02	0.9	5	5.8	0.10	18.5	2.7	12.0	5.80	2.99	4.91	4.42	8.91	8.32
10	Atlantic Ave	PROP-CB-70	PROP-DMH-46	0.02	0.9	5	5.8	0.12	10.1	1.2	12.0	3.89	2.27	9.11	8.99	12.86	13.05
10	Atlantic Ave	PROP-CB-71	PROP-DMH-46	0.01	0.9	5	5.8	0.03	21.5	1.7	12.0	4.61	1.58	9.11	8.75	13.11	13.05
10	Atlantic Ave	PROP-CIT-6	PROP-DMH-44	0.00	0.9	5	5.8	0.06	42.0	7.7	12.0	12.83	4.06	6.64	3.42	9.39	6.00
10	Atlantic Ave	PROP-DMH-44	OUTFALL	0.00	0.9	5	5.8	1.16	25.2	0.5	12.0	3.20	3.75	3.42	3.30	6.00	OUTFALL
10	Atlantic Ave	PROP-DMH-45	PROP-DMH-44	0.00	0.9	5	5.8	1.10	84.8	0.9	12.0	4.50	4.77	4.22	3.42	8.32	6.00
10	Atlantic Ave	PROP-DMH-46	PROP-DMH-45	0.00	0.9	5	5.8	0.14	230.4	1.9	12.0	4.88	4.06	8.65	4.32	13.05	8.32





## ***Section 4***

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### ***Stormwater Management Calculations***





**STANDARD #3 – GROUNDWATER RECHARGE  
ATLANTIC AVENUE – HULL,**

**WATER QUALITY VOLUME (WQV)**

Site Area = 20.40 acres

Total Existing Impervious = 283,558 sq. ft. = 6.51 acres

Total Removed Impervious = 8,444 sq. ft. = 0.19 acres

Total Additional Impervious = 10,192 sq. ft. = 0.23 acres

Total Impervious = 151,636 sq. ft. = 3.48 acres

WQV based on 1.0 inches

WQV =  $1.0/12'' \times 10,192 \text{ sq. ft. (0.23 acres)} = 849.33 \text{ ft}^3$

**GROUNDWATER RECHARGE**

Soils are classified as HSG A, B, C & D based on published soil surveys. Soils are estimated to be primarily 67% HSG A, 9% HSG B, 17% HSG C, and 1% HSG D.

Proposed Impervious Area = 10,192 sq. ft. = 0.23 acres

Recharge Volume = ReVa

$$\begin{aligned} \text{ReVa} &= 0.67 \times \text{Ia} \times 0.6'' + 0.09 \times \text{Ia} \times 0.35'' + 0.17 \times \text{Ia} \times 0.25'' + 0.01 \times \text{Ia} \times 0.1'' \\ &= 0.67 \times 0.23 \times 0.6''/12 + 0.09 \times 0.23 \times 0.35''/12 + 0.17 \times 0.23 \times 0.25''/12 + 0.01 \times \\ &\quad 0.23 \times 0.1''/12 \\ &= 0.01 \text{ ac-ft} \qquad \qquad \qquad \text{approx.} = 413 \text{ ft}^3 \end{aligned}$$



## INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Outlets - All

TSS Removal Calculation Worksheet	B	C	D	E	F
	BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
	Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
		0.00	0.75	0.00	0.75
		0.00	0.75	0.00	0.75
		0.00	0.75	0.00	0.75
		0.00	0.75	0.00	0.75

Total TSS Removal =

25%

Separate Form Needs to  
be Completed for Each  
Outlet or BMP Train

Project: Hull - Atlantic Avenue  
Prepared By: CHA Consulting  
Date: 9/28/2020

\*Equals remaining load from previous BMP (E)  
which enters the BMP





## ***Section 5***

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### ***Stormwater Management Checklist***







# Checklist for Stormwater Report

## A. Introduction

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.<sup>1</sup> This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8<sup>2</sup>
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

<sup>1</sup> The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

<sup>2</sup> For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



# Checklist for Stormwater Report

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## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

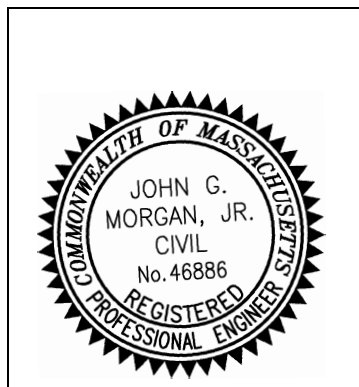
A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

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### Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Signature and Date

9-28-20

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## Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☐ New development
- ☒ Redevelopment
- ☐ Mix of New Development and Redevelopment



# Checklist for Stormwater Report

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## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): \_\_\_\_\_

### Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.





# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☐ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☐ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - ☐ Static
  - ☐ Simple Dynamic
  - ☐ Dynamic Field<sup>1</sup>
- ☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - ☒ Site is comprised solely of C and D soils and/or bedrock at the land surface
  - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
  - ☒ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

### Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
  - Provisions for storing materials and waste products inside or under cover;
  - Vehicle washing controls;
  - Requirements for routine inspections and maintenance of stormwater BMPs;
  - Spill prevention and response plans;
  - Provisions for maintenance of lawns, gardens, and other landscaped areas;
  - Requirements for storage and use of fertilizers, herbicides, and pesticides;
  - Pet waste management provisions;
  - Provisions for operation and management of septic systems;
  - Provisions for solid waste management;
  - Snow disposal and plowing plans relative to Wetland Resource Areas;
  - Winter Road Salt and/or Sand Use and Storage restrictions;
  - Street sweeping schedules;
  - Provisions for prevention of illicit discharges to the stormwater management system;
  - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
  - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
  - ☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
    - ☐ is within the Zone II or Interim Wellhead Protection Area
    - ☐ is near or to other critical areas
    - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
    - ☐ involves runoff from land uses with higher potential pollutant loads.
  - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
  - ☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 4: Water Quality (continued)

- ☐ The BMP is sized (and calculations provided) based on:
  - ☐ The ½" or 1" Water Quality Volume or
  - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

### Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☒ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

### Standard 6: Critical Areas

- ☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☒ Critical areas and BMPs are identified in the Stormwater Report.





# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - ☒ Limited Project
    - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
    - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
    - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
    - ☐ Bike Path and/or Foot Path
  - ☒ Redevelopment Project
    - ☐ Redevelopment portion of mix of new and redevelopment.
- ☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
  - Construction Period Operation and Maintenance Plan;
  - Names of Persons or Entity Responsible for Plan Compliance;
  - Construction Period Pollution Prevention Measures;
  - Erosion and Sedimentation Control Plan Drawings;
  - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
  - Vegetation Planning;
  - Site Development Plan;
  - Construction Sequencing Plan;
  - Sequencing of Erosion and Sedimentation Controls;
  - Operation and Maintenance of Erosion and Sedimentation Controls;
  - Inspection Schedule;
  - Maintenance Schedule;
  - Inspection and Maintenance Log Form.
- ☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

### Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - ☒ Name of the stormwater management system owners;
  - ☒ Party responsible for operation and maintenance;
  - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
  - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
  - ☐ Description and delineation of public safety features;
  - ☐ Estimated operation and maintenance budget; and
  - ☐ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

### Standard 10: Prohibition of Illicit Discharges

- ☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

## ***Section 6***

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### ***Illicit Discharge Statement***





## **ILLICIT DISCHARGE COMPLIANCE STATEMENT**

### **Standard 10: Massachusetts Stormwater Standards Handbook**

Illicit discharges are defined as discharges into waters of the State or municipal separate stormwater system (MS4) that are not entirely comprised of stormwater. Exclusions for non-stormwater discharges into drainage systems include activities or facilities for firefighting, water line flushing, landscape irrigation, uncontaminated groundwater discharge, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, water used to clean residential buildings without detergents, water used for street washing, and flows from riparian habitats/wetlands. These exclusions are subject to change and are under the discretion of the local governing authority.

To the best of our knowledge and professional belief no illicit discharges to the stormwater system, surface waters, or wetland resource areas will remain on the site after construction. We will agree to implement a pollution prevention plan to prevent illicit discharges into the stormwater management system. The design of the site based on the plans and specifications entitled "Reconstruction of Atlantic Avenue and Related Work" prepared by CHA Consulting, Inc., 141 Longwater Drive, Suite 104, Norwell, Massachusetts show a separation and no direct connection between the stormwater management systems and the wastewater and/ or groundwater on the site. To the maximum extent practicable, the design prevents entry of illicit discharges into the stormwater management system.

Engineer's Name: John G. Morgan Jr.  
(please print)

Engineer's Signature:  Date: 9-28-20

Company: CHA Consulting, Inc.

## Section 5

### *Project Plans*

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