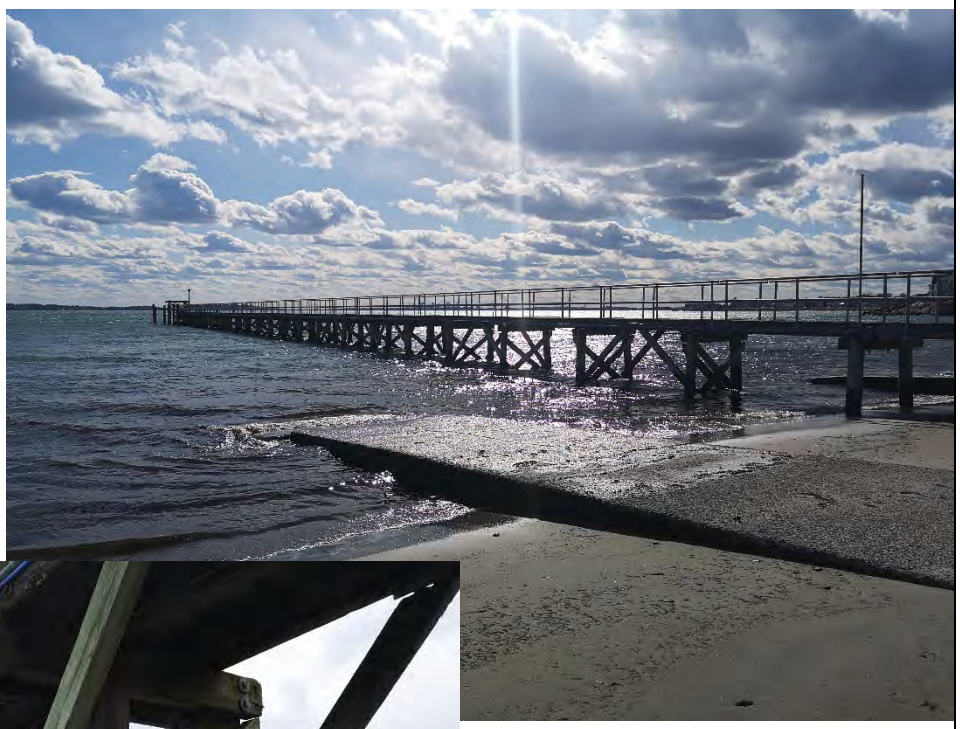
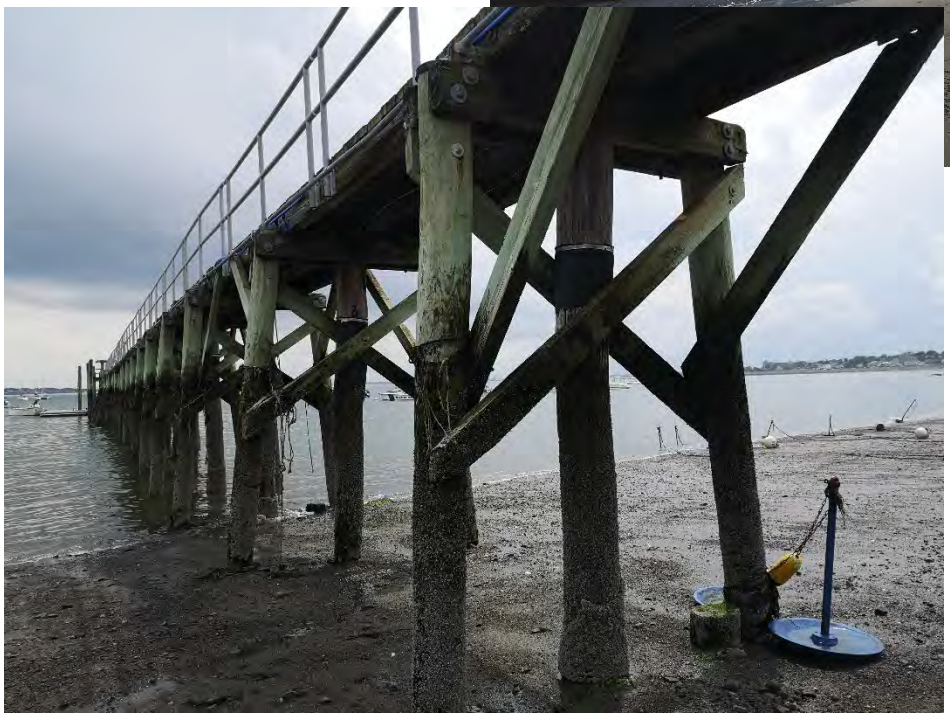
Town of Swampscott- Fisherman's Beach
Williams Town Pier

Redevelopment Feasibility Report





Prepared for:
Town of Swampscott
Department of Community and
Economic Development
22 Monument Avenue
Swampscott, MA 01907

Prepared by:
McAllister Marine Engineering, LLC
16 Hoxie Avenue
Charlestown, RI 02813
www.mcallister-eng.com

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Executive Summary

McAllister Marine Engineering (MME) is working with the Town of Swampscott to lay out, plan and create preliminary designs of a redeveloped, more resilient Town Pier, consistent with the Town's Municipal Harbor and Waterfront Plan. This 15-month process has been conducted under the supervision and with input from the Town of Swampscott Department of Community and Economic Development, as well as the Town's Harbor and Waterfront Advisory Committee (HWAC).

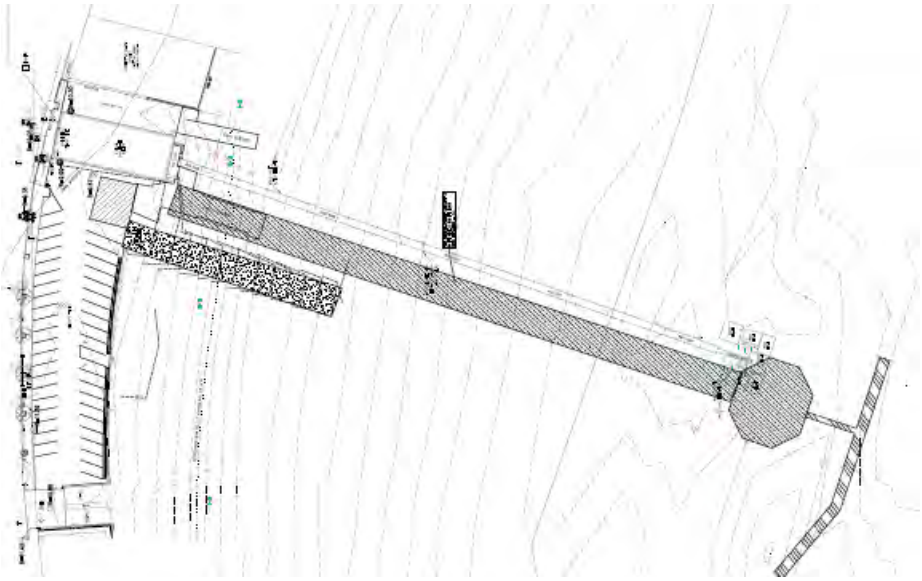
The study area, which includes Fisherman's Beach, the Albert J. Williams Town Pier, and the Historic Fish House is the center of the Town's coastal activities. However, successive storms over the last decade have severely damaged infrastructure, including the historic and iconic Fisherman's Beach Fish House, the Town Pier, and the lower downtown areas of the Swampscott business district. The Town Pier and the vessel moored in Swampscott's Harbor receive direct hits from storms that have east and southeasterly wind patterns.

As part of the efforts to create the Feasibility Study, MME collected Existing Condition Documentation including a Site Survey, Bathymetric Survey, Eelgrass Mapping and Geotechnical Borings. This background data collection was crucial in establishing a baseline condition for the Pier and the Fisherman's Beach Area. As was made evident by the recent "Christmas Storm of 2022" (see below), the pier is experiencing extreme and damaging wave and storm surge conditions that are severely negatively impacting the structural aspects of the timber piles and decking of the Pier. The Town Harbors and Waterfront Committee (HWAC) fears that as extreme weather conditions and rising tidal and storm surge events continues to occur, the pier structure may be rendered unsafe in the near future; leaving boaters with no option but to leave the harbor, thus changing the iconic history of the waterfront and of the Town.

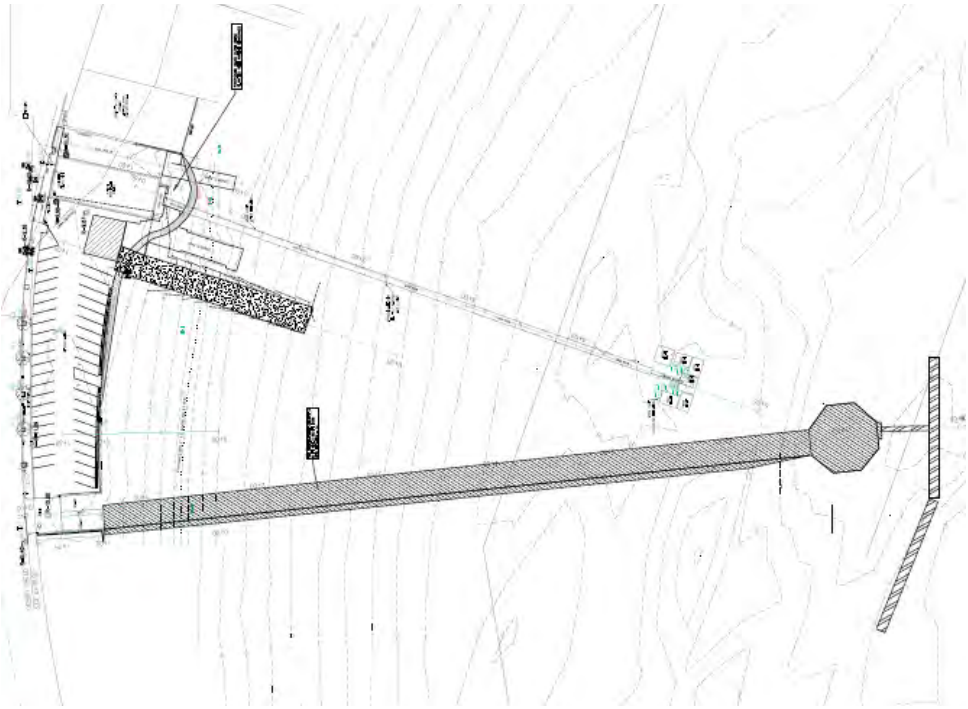
The Town and its consultants reviewed a permit program with Regulators to present the project and better understand their concerns, which were centered around the eelgrass beds within the harbor. MME worked with Megalodon Environmental to conduct a detailed eelgrass assessment to identify the extent of eelgrass within the Harbor, as well as any potential impacts its presence might have on redevelopment options within the Harbor.

- With that background data collected, and after conducting an analysis of the development parameters, MME, working with the Town HWAC, developed preliminary engineering designs, and seven potential Pier layouts were identified. An Alternatives Analysis, used to determine the preferred layouts, evaluated the main goals of the project, establishing the project metrics which included resiliency, community, economy, and tourism impacts. Project considerations including permitting challenges, construction costs, O&M costs, and impacts on existing Harbor uses were also included as components of the Alternatives Analysis. The HWAC Committee reviewed the resulting seven designs, and identified their preferred alternatives on December 5, 2022, to Town Meeting members at a special Town meeting. Based upon the Alternatives Analysis, which included utilizing historical as well as just-acquired data, HWAC interactions, and the outcomes of a preliminary regulatory pre-application meeting, MME recommended that the following two project alternatives be further evaluated and moved to the next step in the design process. **Project Concept Plan No. 5 (renamed as Concept Plan B for future endeavors)**: Installation of a new 441 foot-long, 24-foot-wide Pier parallel to the existing pier, followed by the demolition of the existing aging Pier. This alternative includes the installation of a new

concrete vessel launching ramp and floating wave attenuator docks to be installed at the end of the proposed Pier.



- **Project Concept Plan No. 7 (renamed as Concept Plan A for future endeavors)**: Installation of a new 695 foot-long, 24-foot-wide Pier with a bump out and hexagonal area at its end. Its headlands would be located at the western edge of the Fisherman's Beach parking area (or it could go just beyond that) and runs north-south into slightly deeper water with a new landing area. This alternative includes the installation of a new concrete vessel launching ramp and floating wave attenuator docks to be installed at the end of the proposed Pier.



Both of these preferred alternatives are consistent with and support the project goals and considerations. They will make this upgraded pier accessible to all users, boaters, commercial fishermen, beach goers, visitors, and emergency vehicles. They would also enhance this key feature of the downtown area, provide some economic and tourism benefits, allowing for the Pier to host different events, as well as pop-up stands, and other features to benefit the community. The next step in the design process will down-select one preferred alternative, include additional future Town-wide input, and move the project engineering toward the 30% design milestone, which can be used to start the formal permitting process and develop a permitting strategy and timeline.

The Urgency

The overall condition of the pier is known to be distressed (see existing conditions section of this report in "Existing Pier Structural Review" below), with the pier now well beyond its design life. However, the declining condition of the Pier has, over the last decade, been extensively exacerbated; the reality of increased storm surge, wave action, flood tides, and water forces due to climate change and rising sea levels are all having a profound negative effect on the pier. These forces, that have increased in severity and frequency over the last decade and are forecast to increase in severity over the next decades, are pushing the pier to dangerous conditions. This was made abundantly clear during the very recent "Christmas Storm of 2022", during which the storm tide rose to the highest levels in several years, wreaking havoc on the Pier, Fish house, and immediate coastal area surrounding Fisherman's Beach. The images shown below depict the effects of the storm on the Pier, showing resulting damage.

Figure 1 - Photo of the Pier taken during the "Christmas Storm of 2022" (December 23, 2022). Notice that large sections of the Pier are completely submerged, while other portions of the Pier are experiencing severe wave action. This photo was taken at approximately ¾ tide. At high tide nearly all of the pier was under water.

Figure 2 -The day-after photo, showing damage to the Pier from the storm surge and wave action. A large hole in the Pier opened during the storm. One mariner fell through on the night of the storm. Fortunately, no serious injuries; however the severity of the situation was evident.

Figure 3 - Another day-after photo, showing the erosion of the sand base under some of the footings of the Pier. This type of erosional damage caused by recent storms threatens the integrity of the Pier.

Figure 4 - Damage to the Pierhead and the Fish house from the storm. Note cracking in the foundation pavement surrounding the Fish house. There is a strong possibility that movement of the overall Pier structure during weather events is cracking the foundation and pavement around the Fish house.

The damage from this recent storm highlights the fragility of the Pier structure as it exists today. Storm damage and sea surge place up-pressure on the whole structure. Continued storm action will increase these stresses on the Pier, and the HWAC fears that the entire structure may soon cause significant structural damage which could render the Pier unsafe. If the Pier needs to be abandoned, then the iconic main Town Harbor will be rendered unusable to boaters, and vessels will leave the Harbor, ending an era and changing the historical character of the Town.

Introduction

Purpose

McAllister Marine Engineering (MME) is pleased to provide this Preliminary Feasibility Study (FS) for the redevelopment of the Williams Pier (also known as "the Town Pier"), located at Fisherman's Beach, 391 Humphrey Street in Swampscott, Massachusetts. MME has been working with the Town of Swampscott (hereinafter referred to as the "Town"), through funding provided by the Massachusetts Seaport Economic Council (SEC), to evaluate, lay out, plan, and create preliminary designs of a redeveloped, more resilient pier, consistent with the Town's Municipal Harbor and Waterfront Plan (hereinafter referred to as the "MHWP" or the "Plan"). The feasibility work and designs are significantly informed by historical information and recently acquired data on physical conditions, such as soil and bathymetric conditions, presence/absence of eelgrass, surveys of the pier infrastructure, and other environmental and site-specific factors.

The preliminary FS has been developed in conjunction with *Section 6.4.1 Fisherman's Beach Amenities* of the Town's Harbor and Waterfront Advisory Committee (HWAC) May 2020 Plan and the October 31, 2020 application submitted by the Harbor and Waterfront Advisory Committee (HWAC) to the SEC entitled "Request for Funding to Begin Design and Permitting for the Redevelopment of the Swampscott Town Pier, the Albert J Williams Pier at Fisherman's Beach – Swampscott Harbor, Swampscott, MA," (hereinafter referred to as "the Application").

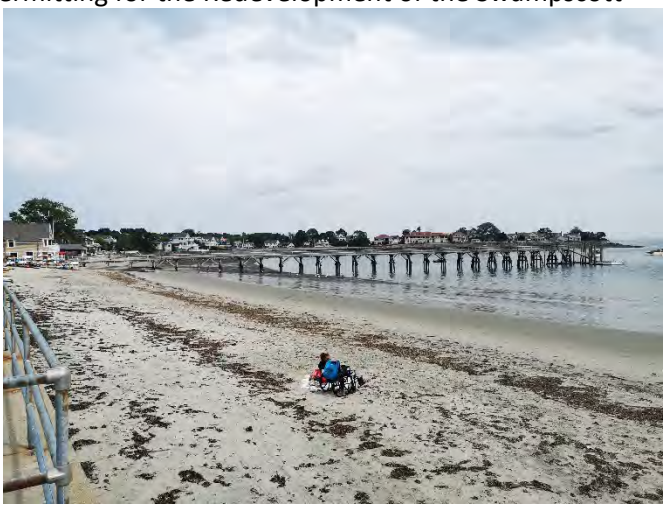


Figure 5 - View of the William's Pier from Fisherman's Beach

The proposed FS designs also help fulfil the sustainability and economic development goals enumerated in the Town's 2025 Master Plan, which call for Swampscott to "*prepare for the impacts of sea level rise*" and "*Improve physical and visual access to waterfront amenities*." According to the Master Plan, the Fish House and Town Pier are a base for lobstermen and fishermen from the area, who dock their boats in the Harbor. With the adjoining upland area above the seawall, it is the center of Swampscott's coastal activities and helps to maintain the Town's connection with its long history of commercial fishing. From the Fish House and to the west (including the Pier), the beach and the upland area are owned by the Town and managed by the Department of Public Works (DPW) and Harbormaster. Many smaller craft such as recreational sailboats, dinghies and kayaks are stored along the beach. The Town Pier has floats on its seaward end that are used to load and unload passengers and supplies to both commercial and recreational vessels. According to the HWAC Harbor Plan, the Harbor at Fisherman's Beach is home to approximately 20 commercial fishing vessels, 25 sailboats , and 100 recreational & sport fishing vessels. With its iconic view across the water to Nahant and the stunning vista of the City of Boston as a backdrop, the Harbor and the Pier at its center forms the central theme and maritime identity of the Town of Swampscott.

The Fish House is listed in the National Register of Historic Places. The structure was constructed in 1896 to offer local commercial fisherman leasable units located within a single building, replacing the numerous small fishing shanties which previously dotted Fisherman's Beach. Today, the building is still used by local commercial fishermen, making it the only municipal fish house in continuous operation during both the 20th and 21st centuries on the East Coast. It is also home to the Swampscott Yacht Club and the office of the Town's Harbormaster.

While this area is the center of the Town's coastal activities, successive storms over the last decade have severely damaged Swampscott's infrastructure, including the historic and iconic Fish House, the Town Pier, and the lower downtown areas of the Swampscott business district. The Town Pier and the vessels moored in Swampscott's Harbor have routinely received direct hits from storms that have east and southeasterly wind patterns. Therefore, at a minimum, improvement and upgrades to the Pier, coupled with resilient measures needed to protect the Fish House and the businesses adjacent to the Pier and Fisherman's Beach, are required to better prepare the structure to weather storms and address impacts from sea level rise.

Project History

Evidence of the Town's historic and currently active marine-based industry, the Fish House was built by the Town in 1896 and is the oldest, active municipal facility of its kind in the U.S. From its pier and adjacent Fisherman's Beach, area residents and visitors can enjoy dramatic views of the Boston skyline, Egg Rock, Massachusetts Bay, and the Nahant peninsula and causeway.

As discussed above, the Fish House is listed on the National Register of Historic Places and was built in 1896 to offer commercial fisherman leasable units in a single building, which replaced the numerous small fishing shanties that previously dotted Fisherman's Beach. The Fish House is located at 391 Humphrey Street, where Humphrey Street and Puritan Road converge, and the Town Pier extends to the south southwest into Nahant Bay from the Fish House. The large, rectangular shingle-style building with Colonial Revival features, which was designed by Henry W. Rogers, is a two-story block structure with a hipped roof. A central pavilion, located under the hipped roof with wood balustrade, forms a look-out which rises above the level of the two ends of the building. Large wall dormers dominate the end elevations and several steeply-sloping shed roof dormers enliven the side elevations. Windows and doors have lattice sashes.

In 2018, the Town received a large grant to effect the repairs noted above to the Fish House structure. The HWAC and the Town will determine how the grant funds will be disbursed.

The Pier was approved at Swampscott Town Meeting in 1941, but not constructed until close to 20 years later. In 1961, the pier was named Williams Town Pier in honor of Tech. Sgt. Albert J. Williams, killed during WWII. The Pier extends south southwest from the Fish House to floating docks in the waters of Nahant Bay. There are mooring locations for approximately 200 vessels in the Harbor. The Town Pier has floats on the southern end that are used to load and unload passengers and supplies to boats and is an access point to the water and beaches for both recreational and commercial use.

Project Area

Fisherman's Beach is south facing, with the eastern portion running parallel to Puritan Road and the western portion of the beach running parallel to Humphrey Street. It is a pocket beach with bedrock headlands defining both the east and west ends. The east end of the beach is located adjacent to Lincoln

House Point Road; and the west end is located near the intersection of Fuller Terrace and Humphrey Street (Route 129). The upper portions of Fisherman's Beach tend to consist mostly of sand; and the lower portion is a relatively flat intertidal beach which tends to consist of gravelly sand.

Fisherman's Beach has a public boat access ramp located near the center of the beach immediately west of the Town Pier. Immediately east of the Pier is a dedicated fishermen's boat access ramp, which is also maintained by the Town. Both of these concrete ramp structures are only usable during the upper ends of the tidal cycle. Parking for the beach, Fish House, and boat ramp is available adjacent to the Fish House.

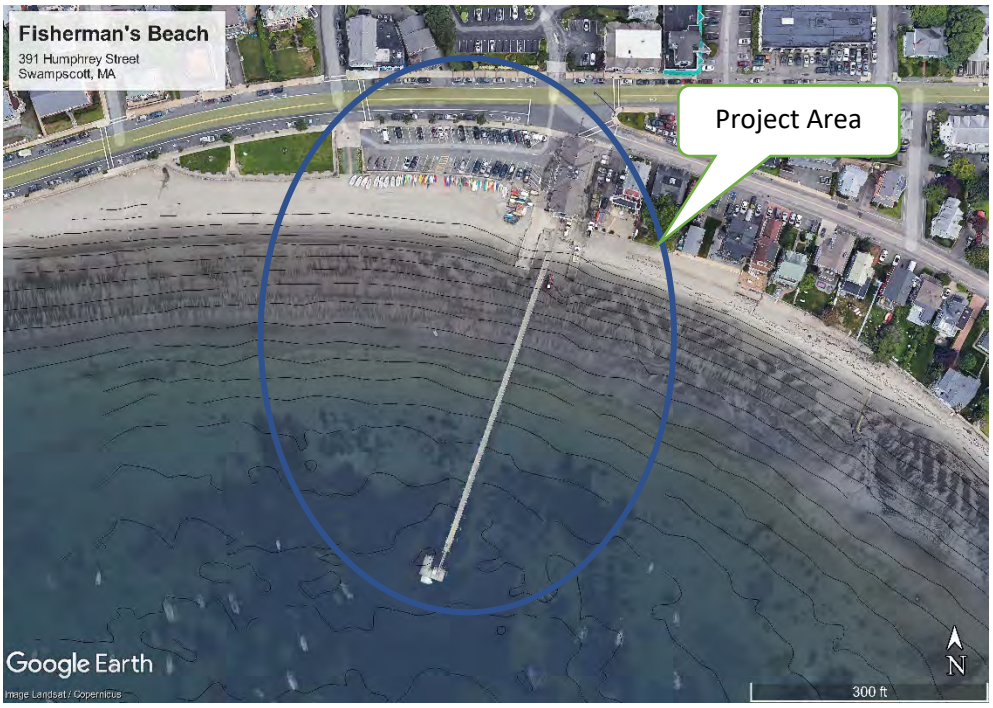


Figure 6- Aerial Locus of Fisherman's Beach showing current orientation of the Town Pier.

Fisherman's Beach is a focal point in the community because it is the main Town harbor for vessels and is the site of the Town Pier. Due to its central location and to the lineal park which runs parallel to and above the seawall, it is perhaps the most accessible beach, both for oceanfront activities and for visual enjoyment (e.g., walking, bicycling, running, etc.). As a central amenity within the Town, the Harbor is home to the many marine and maritime activities that make Swampscott a great place to live and to visit. Kayaking, paddleboarding, swimming, beaching, diving, boating, and fishing are all activities that attract thousands of residents and visitors to the Beach. The Harbor also has one of the most iconic views of the City of Boston across the bay, and visitors and townspeople enjoy walking out on the Pier and enjoying the view.

The Fish House and Town Pier are a base for multi-generational commercial lobstermen and fishermen from the area, who moor their boats in the Harbor, and bring in their catches and store their gear. From the Fish House and to the west (including the Pier), the beach and the upland area are owned by the Town and managed by the DPW and Harbormaster. Many smaller vessels such as sailboats, dinghies, and kayaks are stored along the beach during the summer months. The Town Pier has floats on its

seaward end that are used to load and unload passengers and supplies to both commercial and recreational vessels.

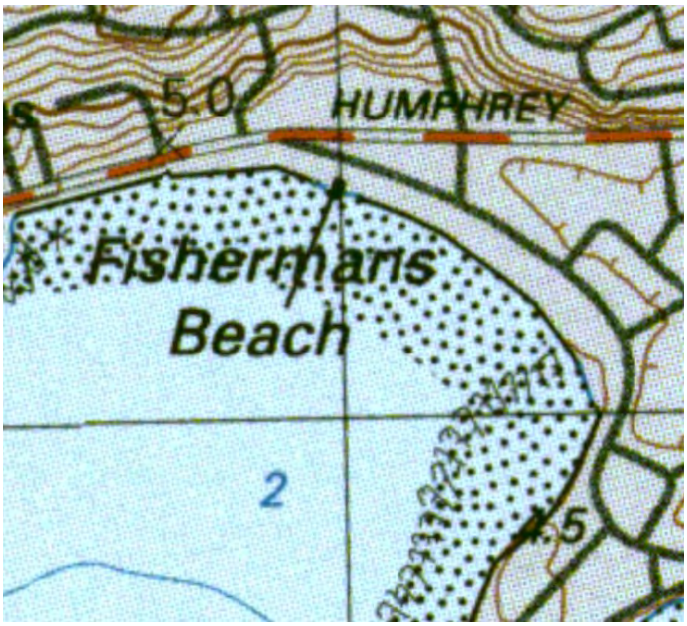


Figure 7- USGS Topographic Map

Land ownership

Fisherman's Beach, the Pier and the Fish House are all owned by the Town. There are, however, a mix of commercial and residential properties that surround the vicinity of the project site (e.g., the Fish House, Pier and adjacent parking lots).

The list of parcels are shown below in Table 1.

Land Ownership Table of Parcels Abutting the Fisherman's Beach Area

Parcel Number	Property Address	Owner Name	Co-Owner Name
19-109B	434 440 HUMPHREY ST	PATSIOS CHARLES A TRUSTEE	OF THE HUMPHREY ST SWAMPSCOTT
19-115	410 HUMPHREY ST	PARADISE BRUCE E	
19-116	400 HUMPHREY ST	CASSIDY MARILYN L TRUSTEE OF	THE HUMPHREY ST REALTY TRUST
19-171	16 PURITAN RD	MAIN STREET AUTO CENTER INC	
19-171A	PURITAN RD	SWAMPSCOTT TOWN OF	
19-191	7 PURITAN RD	GRIMES ROBERT V	CLARA M GRIMES
19-192	11 PURITAN RD	GOLDSTEIN JANE	DEPPER BRUCE R
19-193	15 PURITAN RD	RYAN JOSEPH F/JOSEPH A MCHUGH	TRS OF 15 PURITAN RD RLTY TRUS
19-194	17 PURITAN RD	CASSIDY MARILYN L TRUSTEE OF	THE PURITAN RD REALTY TRUST
19-195	23 PURITAN RD	BISHAY MAGDY	BISHAY MIRERVA
19-109	432 U-1 HUMPHREY ST	RAYMOND HARLOW P	HEATHER A RAYMOND

19-109	432 U-2 HUMPHREY ST	RYAN JOSEPH F TR	%LYNE WOODWORTH & EVARTS LLP
19-109	432 U-3 HUMPHREY ST	RIVERDALE CONSTRUCTION LLC	
19-109	432 U-4 HUMPHREY ST	GOLDEN FRANK	GOLDEN DEBORA
19-109	432 U-5 HUMPHREY ST	BYRNE TRACEY E TRUSTEE	C/O ANN BYRNE
19-109	432 U-6 HUMPHREY ST	COHN NANCY M	
19-109	432 U-7 HUMPHREY ST	GIBB IRINA	
19-109	432 U-8 HUMPHREY ST	SIMMONS JR RICHARD D	ROBERTS CAROL B TRS OF THE
19-109	432 U-9 HUMPHREY ST	BROX ALEXANDER/ANNEMARY BROX	CYNTHIA BROX ROWLETT
19-109	432 U-10 HUMPHREY ST	BONACORSO CHRISTOPHER J	INGEMI AMANDA M
19-109	432 U-11 HUMPHREY ST	ANDREANO EMILY L	
19-109	432 U-12 HUMPHREY ST	CASTUCCI BRIAN	
19-109	432 U-13 HUMPHREY ST	SIDERI RICHARD	
19-109	432 U-14 HUMPHREY ST	CALLAHAN BRIAN ALEXANDER	
19-109	432 U-15 HUMPHREY ST	BOOMA ROLAND C TRUSTEE OF	THE ROLAND C BOOMA TRUST
19-109	432 U-16 HUMPHREY ST	CAREY LINDA A	
19-109	432 U-17 HUMPHREY ST	KING CURT R	CATHLEEN M KING
19-109	432 U-18 HUMPHREY ST	MULDOON RAYMOND P	MULDOON IVY M
19-109	432 U-19 HUMPHREY ST	FALSAFI MOHAMMAD	
19-109	432 U-20 HUMPHREY ST	CAVALLARO ROBERT P TRUSTEE OF	THE CAVALLARO FAMILY TRUST
19-109	432 U-21 HUMPHREY ST	BARBUZZI ANTHONY P	
19-109	432 U-22 HUMPHREY ST	FESSENDEN DAVID DONALD	
19-109	432 U-23 HUMPHREY ST	REBLIN PATRICIA A TRUSTEE OF	THE PATRICIA A REBLIN REVOC-
19-109	432 U-24 HUMPHREY ST	PAQUETTE MICHAEL T	
19-109	432 U-25 HUMPHREY ST	WAIN RICHARD P TRUSTEE OF THE	RICHARD P WAIN TRUST OF 2011
19-109	432 U-26 HUMPHREY ST	SACK LESLIE R/BETTE LESTER	JOEL ROOKS
19-109	432 U-27 HUMPHREY ST	FERRO KAREN L	UNIT 27
19-109	432 U-28 HUMPHREY ST	GHERZI BARBARA A	CHRISTINE ELENA GHERZI
2-107	386 HUMPHREY ST	OFARRELL RORY	KATHERINE GALLAGHER
2-107A	380 HUMPHREY ST	LIVINGSTON JOEL	DEBORAH E LIVINGSTON
2-108	374 HUMPHREY ST	MOORE SARAH A	
2-108	374 HUMPHREY ST	GIFFORD LINDA A TRUSTEE OF THE	VERNE B GIFFORD IRREVOCABLE TR
2-108	374 HUMPHREY ST	ACAMPA CHRISTINE M	
2-108	374 HUMPHREY ST	SMITH JAMES E	ABBE Y SMITH

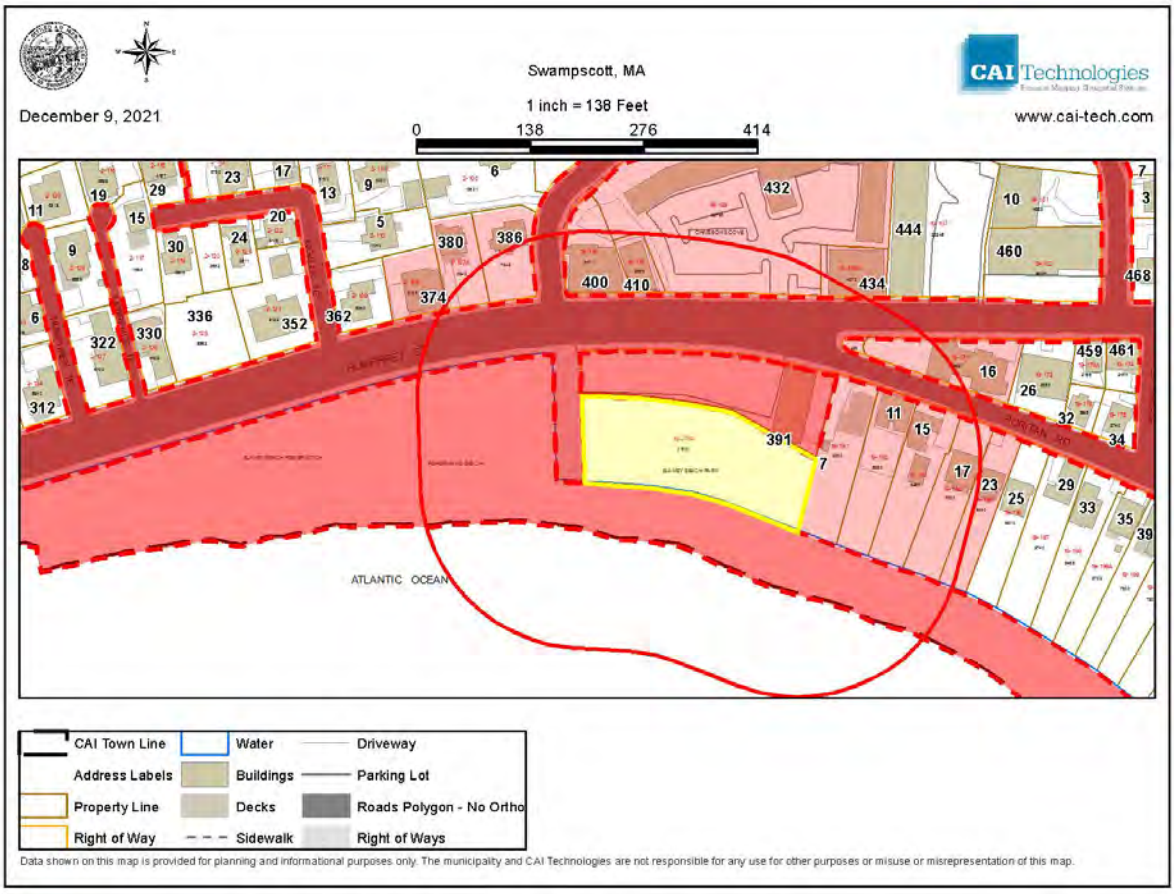


Figure 8 - Swampscott Assessor's Parcels

Baseline Environmental Conditions and Resources

Flood Plains

FEMA, in its Flood Rate Insurance Map Panel 25009C0533G, effective 7/16/2014, shows two types of flood plains in the area surrounding the Town Pier. There is a Zone VE, with a floodplain elevation of 22 ft (NAVD88) which encompasses the landward portion of the Pier and Fish House area. The second area, located after Humphrey Street to the north and northeast, has a zone AE with a floodplain elevation of 15 feet (NAVD88). The VE zone is defined as *"Areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action*[1]*."* The Zone AE is not affected by storm induced velocity wave action and is defined as *"Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods*[2]*."*

[1] Zone VE and V1-30 | FEMA.gov
[2] Glossary | FEMA.gov

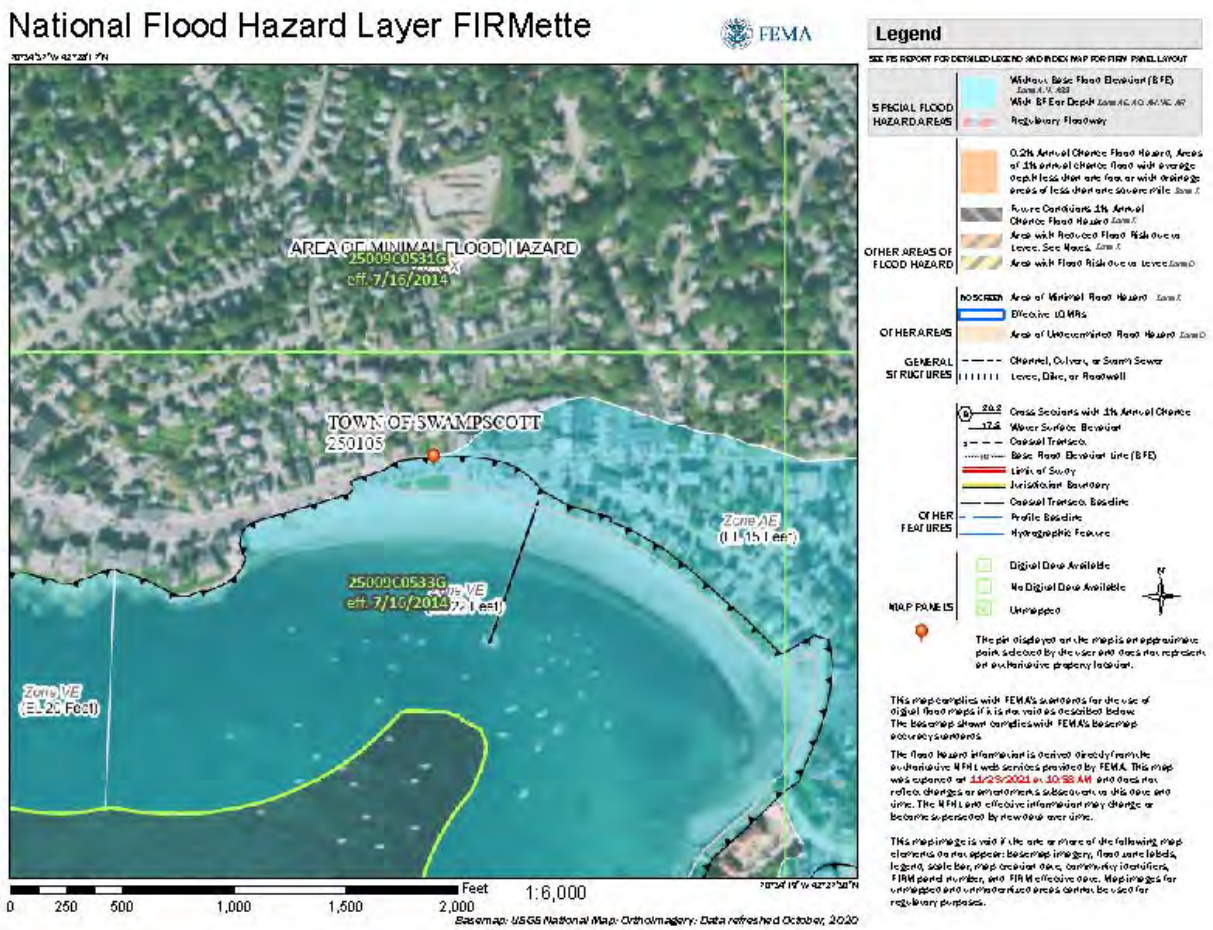


Figure 9 - FEMA Floodplain Map of Fisherman's Beach, the Harbor, and surrounds.

Chapter 91 Regulations (310 CMR 9.00}

The Chapter 91 regulations provide the Massachusetts Department of Environmental Protection (MassDEP) with jurisdiction of structures located (or to be constructed) within current/historical tidelands and regulate public-access rights and use of tideland areas. According to Chapter 91:

- Areas of land that are upland of historic high-water lines are not within MassDEP jurisdiction and there are no landside buffer areas.
- Areas of land that are between the historic high- and low-water lines are considered private tidelands and are subject to MassDEP regulations that are designed to provide for public access to and from the water.
- Areas of land below the historic low-water lines are considered Commonwealth Tidelands and are subject to broader public rights for the use and enjoyment of the water.
- Public pier projects with either water-dependent uses or accessory to water-dependent uses, are specifically encouraged by the Chapter 91 regulations.

Land Under the Ocean (310 CMR 10.25)

Nearshore areas of Land Under Ocean (LUO) are likely to be significant resources to provide storm-damage prevention, flood control and protection of wildlife habitat and, where they are present,

shellfish. Nearshore areas of LUO can help reduce storm damage and flooding by buffering wave energy through the formation of offshore bars or by supplying sediments to adjacent beaches.

Coastal Beach (310 CMR 10.27)

Coastal Beaches (CBs) will likely play a key role in storm damage prevention, flood control and the protection of marine fisheries similar to LUO. They may also be significant to the protection of Land Containing Shellfish (LCS) when shellfish are present. CBs may reduce wave energy, and natural beaches provide sediment to LUO (which serves as a buffer to storm waves). The CB at the subject property would be classified primarily as a tidal flats. Tidal flats are typically significant to marine fisheries, LCS and the protection of wildlife habitat.

Figure 10- Photo Looking North at Coastal Beach and Bank from the Pier

Land Containing Shellfish (310 CMR 10.34)

LCS is significant to the protection of marine fisheries when such lands have been identified and mapped by the Conservation Commission, the local shellfish constable, the MassDEP and the Massachusetts Division of Marine Fisheries (DMF).

Land Subject to Coastal Storm Flowage (310 CMR 10.04)

This resource area is significant to flood control and storm damage prevention, but is not regulated as a function of marine fisheries protection. Land Subject to Coastal Storm Flowage (LSCSF) extends to past the project site and Fisherman's Beach and onto Humphrey Street.

Natural Heritage and Endangered Species (321 CMR 10.00)

The Massachusetts Endangered Species Act and its implementing regulations are intended to protect rare species and their habitats by prohibiting the "*take*" of any plant or animal species listed as Endangered, Threatened or Special Concern. The regulations establish procedures for the listing and protection of rare plants and animals and outlines project review filing requirements for projects or activities that are located within a Priority Habitat of Rare Species. This subject property is not mapped as a priority habitat of rare species or as estimated habitats of rare wildlife.

Essential Fish Habitat (50 CFR Part 600)

Fish and other marine species depend on their habitat to survive and reproduce. Congress improved the Nation's primary fisheries law in 1996 to recognize the importance of healthy habitat for commercial and recreational fisheries.

This Federal rule established guidelines to assist the Regional Fishery Management Councils (Councils) and the Secretary of Commerce (Secretary) in the description and identification of Essential Fish Habitat (EFH) in Fishery Management Plans (FMPs), the identification of adverse effects to EFH, and the identification of actions required to conserve and enhance EFHs. The regulations also detail procedures the Secretary (acting through NMFS), other Federal agencies, and the Councils will use to coordinate, consult, or provide recommendations on Federal and state actions that may adversely affect EFH(s). The intended effect of the rule is to promote the protection, conservation, and enhancement of EFHs. The project area (along with the entire Massachusetts eastern coastline) is mapped as EFH.

Figure 11- MassGIS Progression of Eelgrass Mapping

Eelgrass

An important Swampscott aquatic resource is the bed of eelgrass (Zostera marina) located off of Fisherman's Beach. Eelgrass is a productive near shore marine habitat that supports diverse floral and faunal species, absorbs nutrients, stabilizes sediments, and provides habitat and detrital biomass for a diversity of life. In a study taking samples in Nahant, Gloucester, and Boston, 34 different species of fish were found to use eelgrass as either refuge, nursery, spawning or foraging habitat. Species identified in the study ranged from tiny fish, such as sticklebacks and bay pipefish, up to apex predators such as sand tiger sharks and striped bass. A local Swampscott example of a species that relies on eelgrass is the black brant (Branta bernicla), a small goose whose diet largely consists of eelgrass. A flock of up to 40 black brant is observed during a portion of the winter directly off of Fisherman's Beach dining on eelgrass. Sea lettuce and other marine vegetation is also found in shallows at Fisherman's as well as other beaches in the area. As discussed below in detail, the eelgrass located off of Fisherman's Beach has been subject to

studies and evaluation since 1958. Eelgrass extents can vary over time and between seasons, including the health and the density of growth in the beds. Figures 8 and 9 provide eelgrass habitats from 2012 and 2015/2017 which exhibit significantly differing geometries.

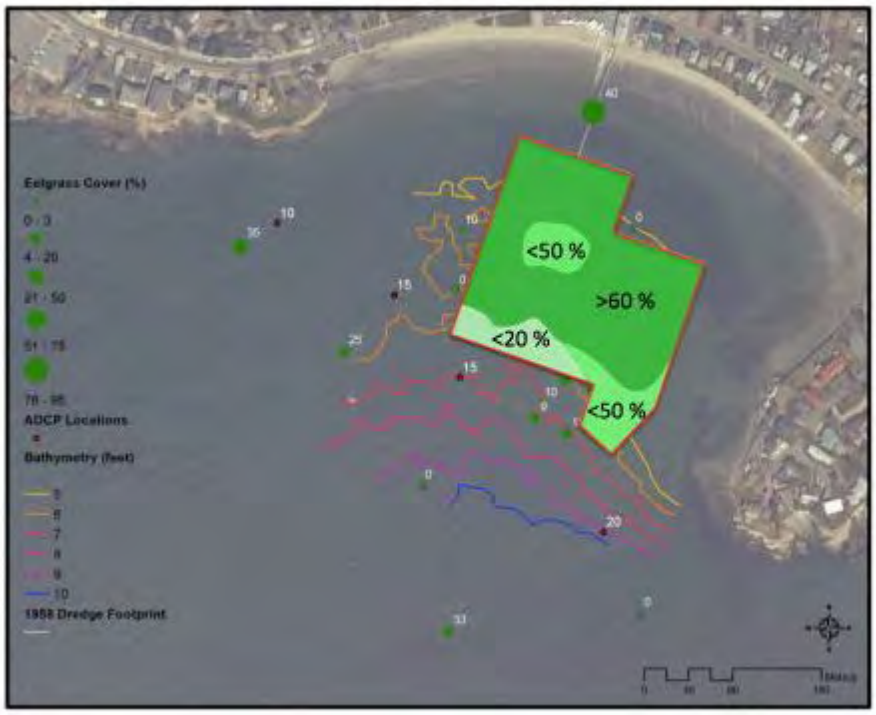


Figure 12 - Mapped Eelgrass from 1958 Dredge Area with density of Eelgrass Coverage

Figure 13 - 2015-2017 Extent of MassDEP Eelgrass Mapping

Topography and Geotechnical Information

The Project study area sits relatively low with respect to topography, with site grades around elevation 11 (NAVD 88) in the parking area adjacent to the Fish House and the beach sloping down from elevation 10 to MHW (elevation 4.3) The highest elevations in the study area are associated with Humphrey Street, at the northern end of the study area.

The Division of Conservation and Recreation (DCR) conducted a series of topographic surveys of the beach area to better understand the movement of sand from summer to winter profiles. The Fisherman's Beach profile, which includes a long relatively flat intertidal area, did not exhibit a significant change in profile based on the seasons, with the exception of the top of the beach, near the wall at the edge of the parking lot.

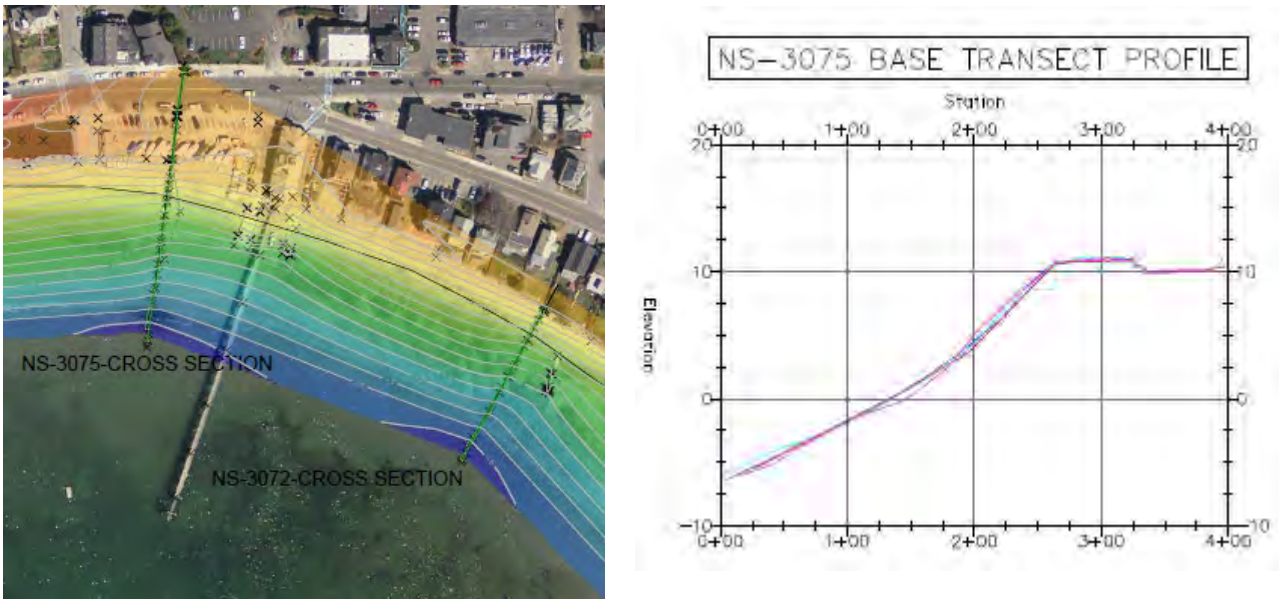


Figure 14 - Plan view and profile of DCR Survey Transects

Soils in the study area are generally mapped (by the USDA's NRCS) as Urban land (in the parking area and along Humphrey Street) and Beaches, as sand (south of the improved areas). The Beaches' sand unit is described as having 0-10 inches of sand, and takes form on back-barrier beaches, shores, beaches, and barrier beaches.

In order to gain a better understanding of the geotechnical conditions that underly the upper sands, the MME team conducted a series of borings along the beach. A preliminary geotechnical subsurface exploration program, consisting of two borings (RMA22-1 and RMA22-2), was undertaken to provide limited (field) geotechnical data along the beach. Automatic hammer blows, split spoon samples, macro (acetate lined) samplers, and dual tube drilling methods were used to collect geotechnical data.

The subsurface exploration program was performed by SAGE EnviroTech Drilling Services of Pawtucket, Rhode Island (drillers) and observed by RMA GeoEnvironmental, LLC personnel (geotechnical engineers) on January 18, 2022. When applicable, split spoon soil samples were generally obtained at two- and five-foot intervals using a two-foot-long, 1-3/8 inch inside diameter split spoon sampler in substantial conformance with ASTM D-1586. The standard ASTM method of driving the sampler was employed

using a 140-pound automatic hammer falling 30 inches. In some cases, acetate lined macro samplers were driven to obtain a continuous representation of the soil stratum for logging purposes.

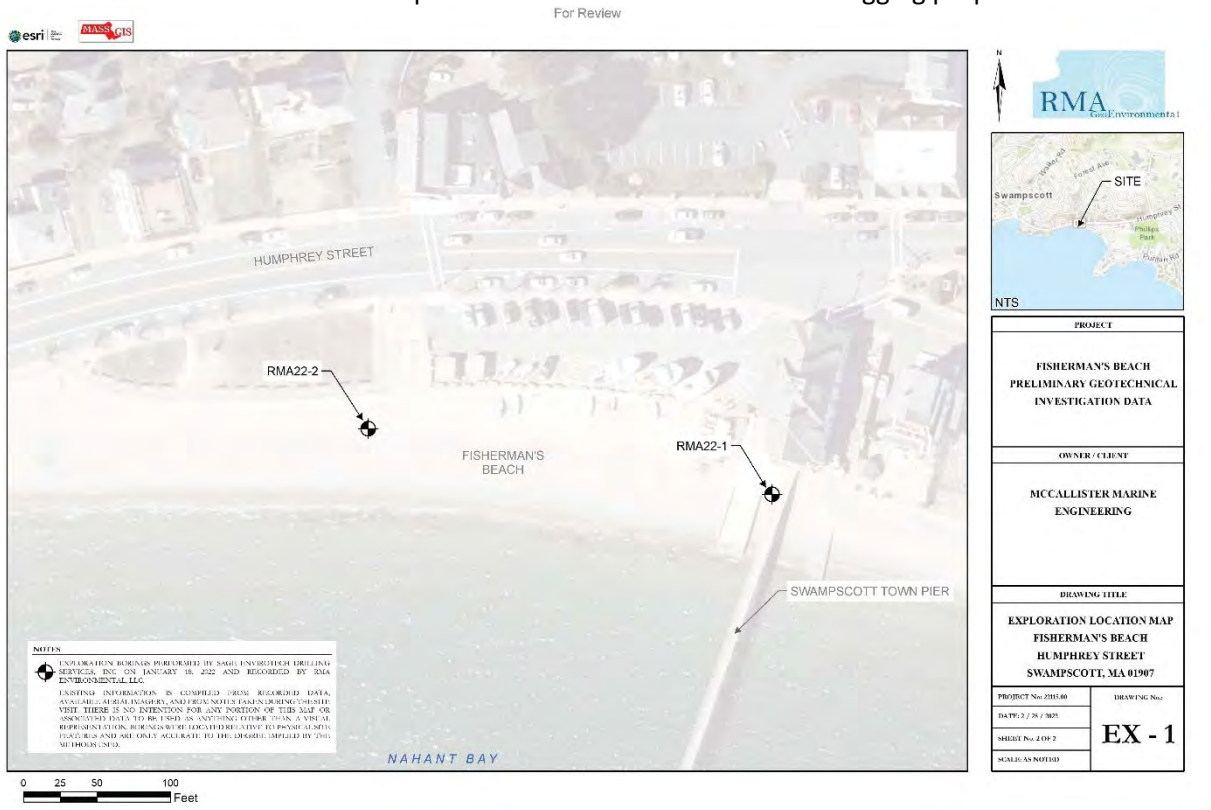


Figure 15 - Location of Borings Conducted

The subsurface geology in both locations were consistent and were comprised of two distinct layers, a beach deposit formed by tidal circulation and potentially disturbed by surface activity; and a layer of fine glacial deposits formed in the marine environment.

Beach Deposits

The stratum encountered within the top 10-to-11 feet of both borings consisted of a beach deposit containing poorly graded sand with gravel (SP with GP). This stratum is typical of a coastal beach environment and the material was likely deposited by tidal circulatory action but may have been disturbed by surface activity (cutting, filling, etc.). Typically, a beach deposit may vary over short distances – although they were consistent across both borings. The beach deposits were typically loose in density, as blow counts were less than ten blows per six inches of advancement in all but one sample, where the soil was medium dense. Logs of the soil borings are attached to this transmittal and their locations are shown on attached figures.

Fine Glacial Deposits (marine)

Underlying the beach deposit layer was a fine glacial stratum consisting of silty clays (CL-for engineering purposes) which were likely deposited by a combination of glacier- and marine-related processes. This soil layer was found in both borings at 10.5 and 11.5 feet below the ground surface (bgs) near elevation (-)4 feet NAVD88. All borings terminated within this layer at 27 feet bgs. This material was classified as plastic in the field and the clay content increased with depth. Furthermore, as noted on the boring logs and in laboratory test soil descriptions, this material is anticipated to be influenced by marine organic

materials. Blow counts within this layer ranged from 4 to 11 per six inches of advancement, indicating a relative density ranging from soft to stiff. In general, blow counts and densities tended to decrease below the transition zone between the overlying material in correlation with the increasing clay content.

DEPTH BELOW GROUND SURFACE TO TOP OF STRATUM		
MATERIAL	RMA22-1 El. 6.5 ft[1]	RMA22-2 El. 7.5 ft[1]
Beach Deposits	GRADE	GRADE
Fine Glacial Deposits (marine)	10.6 feet	11.5 feet
Eob[2]	27 feet	27 feet
Groundwater[3]	2 feet	1 foot

Notes:

1. Ground surface elevation was interpolated to the nearest half foot using elevation contours from the "Existing Conditions Plan of Land In Swampscott, MA"| Dated: 11.11.21 - By: Hancock Associates. We understand the elevations provided in the Existing Conditions Plan are referenced from the North American Vertical Datum of 1988.
2. Scheduled depth (refusal was not encountered)
3. At time of exploration – influenced by tide

Groundwater

Groundwater was observed within both borings between 1 and 2 feet bgs at the time of investigation. Observations occurred between tides, and groundwater is anticipated to be tidally influenced. It should be noted that groundwater levels are known to fluctuate due to local and regional factors including, but not limited to, tidal variations, precipitation events, seasonal changes, and periods of wet or dry weather.

Bedrock and/or Boulders

Refusal (drilling or sampling) on bedrock and/or boulders was not encountered within the scheduled depths of these explorations. As such, the depth and competency of bedrock could not be evaluated. Rock outcrops observed at both headlands to the beach suggest near surface rock is present within the surrounding environs. In addition, boulders in the form of obstruction may be present within the in-situ natural deposits and disturbed material. In general, at any locale, the location and stratigraphy of bedrock should be expected to show considerable variability both laterally and with depth.

Laboratory Testing:

A suite of laboratory testing was performed on six retrieved samples including four grain size analyses, two Atterberg limit tests, and two corrosivity analysis programs. The results of the laboratory testing are summarized and discussed below. The laboratory testing sheets are attached as an appendix to this report.

Boring No.	Sample ID.	Depth (ft)	Representative Soil Strata	% Gravel	% Sand	% Fines	Atterberg Limits LL | PL | PI
RMA22-1	S-2	2 – 4	Beach Deposit	43.7	53.4	2.9	Non-Plastic
RMA22-1	S-7	25 – 27	Fine Glacial	0.0	1.1	98.9	47 | 20 | 27
RMA22-2	S-1	0 – 2	Beach Deposit	23.7	73.8	2.5	Non-Plastic
RMA22-2	S-4	15 – 17	Fine Glacial	0.0	5.7	94.3	45 | 18 | 27

The laboratory analyses helped refine and confirm the grain size distribution, verified the "SP with G", and "CL" USCS classifications as determined for engineering purposes. See testing sheets for a breakdown of clay vs silt and received moisture contents of plastic samples.

Boring No.	Sample ID.	Depth (ft)	Representative Soil Strata	Sulfate (mg/kg)	Chloride (mg/kg)	pH	Electrical Resistivity at 60°F (Ohm-cm) As Received | Saturated
RMA22-1	S-2	2 – 4	Beach Deposit	512	3360	6.5	183 | 178
RMA22-2	S-4	15 – 17	Fine Glacial	34	97	6.8	1300 | 1300

Corrosivity analysis determined the soil stratums to be highly corrosive. Corrosivity decreased marginally with depth.

Existing Pier Structural Review

The existing pier was constructed and completed in 1961, making it 61 years old at the time of preparation of this report. While a design life is typically determined based on an analysis of the detailed design elements, globally speaking, open pile timber-type structures such as the Pier typically have a design life of 30-50 years. Based on that, it is highly likely that the original timber structure is beyond its original design life. The Town has been actively maintaining and repairing the Pier through replacing cross-tie elements and surface boards when they become damaged or are missing, extending the life of the Pier beyond its design life. That said, the condition of the Pier is clearly showing its age, and several significant elements of the Pier show reduced structural capacity.

The MME team conducted visual inspections of the existing conditions of the Pier to better understand the need for upgrades and an anticipated timeline. A full structural assessment of the Pier was not conducted, as that would have required diving and destructive analysis both above and below the water line and the mudline all of which were outside of our scope.

The existing timber pier is roughly 441-feet-long and 5.9-feet-wide, with an aluminum gangway with six wooden floats. The pier deck elevation varies slightly but is generally around elevation 9.0 ft (NAVD 88 or 14.2 ft MLLW). The pier consists of 27 bents spaced at 16.5-foot on center. The nearshore bents, up to Bent 7, include two plumb piles per bent, then from Bent 8 to Bent 20 there are three plumb piles per bent, and from Bent 21 to Bent 27, there are three plumb piles and two batter piles per bent. Piles are 12-inch diameter creosote piles.

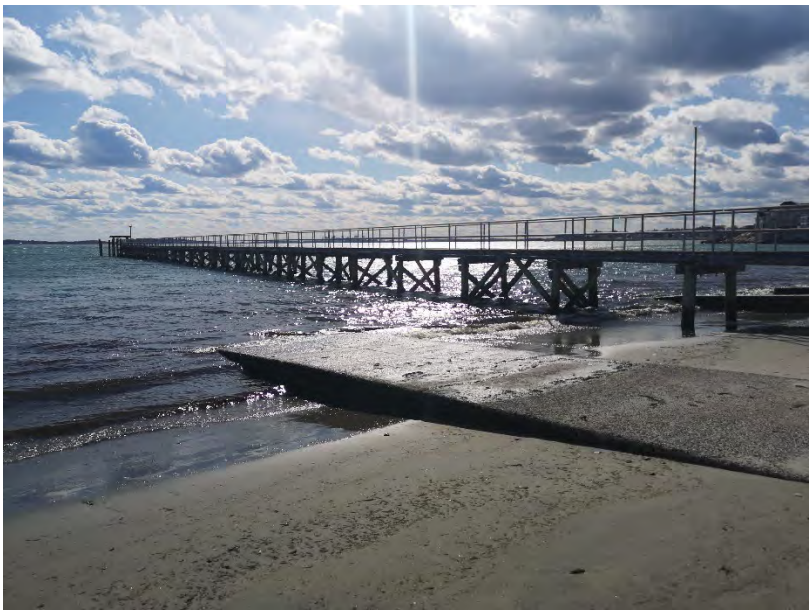


Figure 16 - View of Pier from East Side looking Southwest

On two occasions, in June of 2021 and March of 2022, MME conducted a visual inspection of the pier to better understand its condition. These visual inspections were conducted around low tide in order to maximize the amount of pier infrastructure that could be observed. The intent of this work-flow component was to document existing conditions to create a baseline that could be used and compared against over time to better understand the deterioration of the Pier structure and to note any major noticeable issues.

Timber is a non-homogenous material, and the deterioration can be variable throughout a wooden structure. Often, most of the impact occurs in the inter-tidal and/or splash zone, the area between the tide lines or what would be impacted by wave action on the pier. Some of the most notable issues that were noted were:

- Splitting and splintering of piles;
- Inconsistent geometry of structural members;
- Lack of pile wrapping in the intertidal zone; and,
- Inconsistent use of materials for connections.

Figure 17 -Deterioration of Cross Section of Cross Beam

Figure 18- Inconsistent Taper of Piling

Figure 19 - Inconsistent use of fastener materials

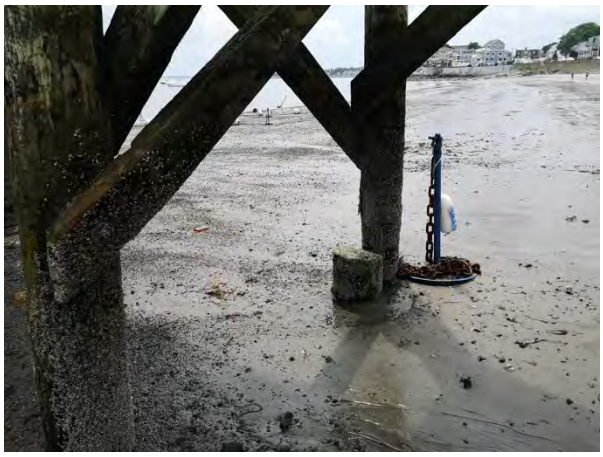


Figure 20- Marine growth on pile and cross-brace

Figure 21 - Split Timber Pile

Figure 22 - Split pile and deterioration of surface

Figure 23- Splintered and Damaged Pile

Figure 24- Deterioration of Pile

Figure 25- Damaged Pile in Intertidal Zone

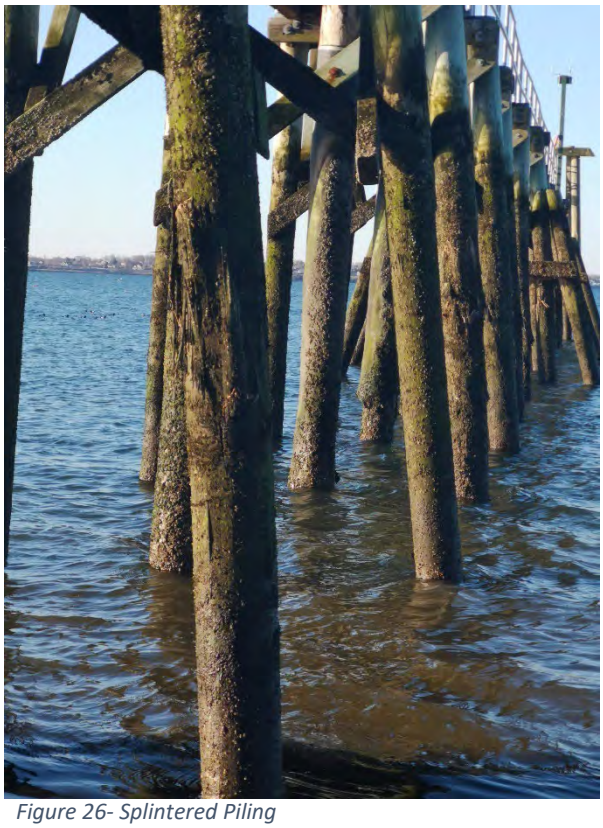


Figure 26- Splintered Piling

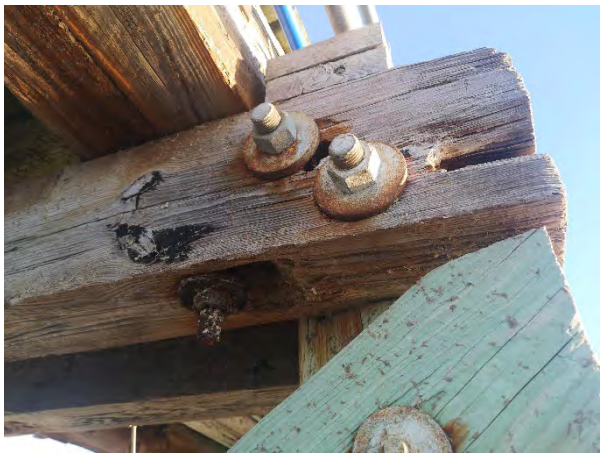


Figure 27- Damaged Pile Cap Beam

Figure 28- Damaged/ Lack of Pile Wrap

Figure 29- Pock marks in weathered Decking

Given the advanced age of this structure and some of the issues noted and documented above, the Town should continue to monitor the structure, particularly after storm events and heavy wave action events, which could accelerate deterioration or cause new impacts which could compromise the structural integrity of the pier.

Eelgrass Assessment

As an early work-flow component of the Town Pier FS project, MME organized and ran a pre-application meeting with the majority of the resource-management regulatory/permitting officials which will be required to review and eventually issue permits for the final selected Pier (and Living Reef projects, though that was not discussed as part of the meeting). As part of the meeting, MME provided the resource regulators with the project background and conceptual layouts for the pier that were being included in the FS. The pre-application meeting was conducted with representatives from the Town, MME, the US Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA) Fisheries, the Massachusetts Department of Coastal Zone Management (CZM), MassDEP, Massachusetts Environmental Policy Act (MEPA), HWAC, and the Swampscott Conservation Commission. During this meeting, the regulators raised concerns regarding the protection of eelgrass beds located within Swampscott Harbor as they represent a valuable and highly-limited-in-extent (at the scale of the Commonwealth) natural resource that they are tasked by Federal, State and local regulations to protect. The resource regulators were most emphatic that they would not evaluate any redevelopment/reconfiguration scenarios of the Town Pier, consider any dredging of the harbor or the Living Reef, in the event that such proposed activities would impact healthy eelgrass beds. This position was not anticipated by MME or the Town as a high-quality eelgrass survey was conducted by a subject matter expert (SME) circa 2013 as part of the Town's earlier evaluation of harbor dredging plans.

To support their position that the eelgrass beds were more extensive than those evaluated in 2013, the regulators referenced a 2018 blogpost from Seagrass Soundings (SeagrassSoundings: Expanded Eelgrass Meadows in Swampscott) that references a 2017 mapping project performed by the Massachusetts DMF that showed a significant expansion of eelgrass in the Harbor (i.e., a 665% expansion from MassDEP's 2012 mapping). Based on this pre-application meeting with the regulatory authorities, it appears that the extent of the eelgrass bed shown in Figure 26 would need to be addressed for both the Pier and Living Reef project components, and that the resource regulators would be opposed to any proposed project within the mapped eelgrass beds.

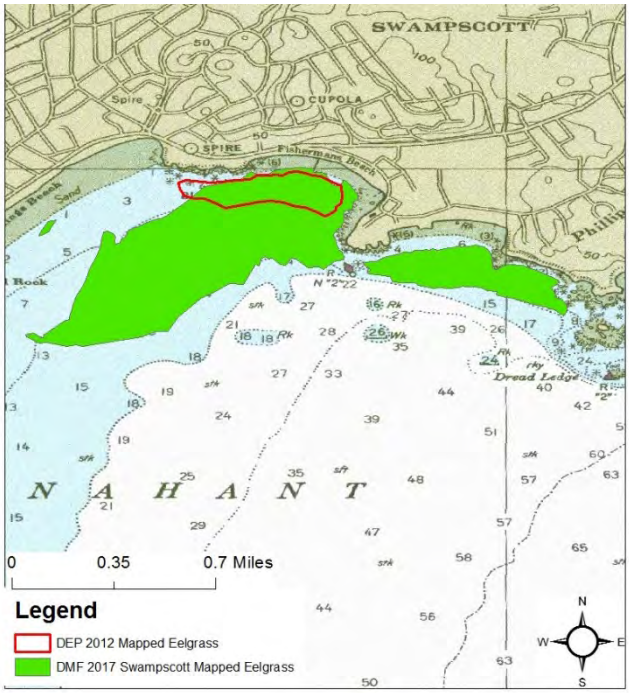


Figure 30 - Screen Capture of Seagrass Soundings Blog

The regulatory SMEs also stated that the eelgrass beds typically fluctuate in size and density and that the publicly available GIS eelgrass data would not be sufficiently accurate and up to date to support their evaluation of any proposed project(s) within the harbor. They were quite clear in the pre-application meeting that an updated eelgrass survey, conducted by an appropriate Town/MME-retained SME, would be required. Further, this survey would be required to be conducted during the peak biomass growing season for eelgrass, which occurs between the latter parts of June through early August.

As such, the pre-application meeting met MME's and the Town's project goals of identifying a critical path project work-flow component that will be required by the resource regulatory/permitting agencies. Therefore, MME, along with consultation with the Town and the SEC, created a "*change of course*" to address the concerns raised during the pre-application meeting. This included

- Not performing additional geotechnical borings and conducting additional Pier rebuilding/reconfiguration design scenarios.
- Conducting an eelgrass survey both in the potential locations of the Pier and the Living Reef, as these data will be required by the permitting agencies.

Summer 2022 Eelgrass Mapping Program/Bathymetric Survey

MME worked with SMEs from Megalodon Environmental, LLC (Megalodon) to conduct an eelgrass mapping effort within the Harbor in accordance with the requirements of the resource regulatory authorities, during July and August of 2022 peak biomass period. Further, MMR conducted a high-resolution signal-beam bathymetric survey to assess bottom conditions across the Harbor.

Megalodon and MME prepared an Eelgrass Habitat Survey Plan for the Town to review and approve prior to performing field survey assessment. This plan was made available to the appropriate regulatory authorities prior to the target survey date. Upon receiving the regulator's comments, Megalodon and

MME incorporated the necessary edits, taking into consideration health and safety as well as scientific defensibility of the resultant data, and issued a final survey plan in June 2022.

The eelgrass assessment was performed concurrently from the same vessel MME used to conduct the hydrographic survey. The two assessments included the following components:

- Use of an echosounder (side-scan sonar) and an underwater video camera to obtain both the bathymetric seafloor conditions and delineate eelgrass habitat within the survey footprint, simultaneously.
- A video camera to ground-truth eelgrass presence and density, thus eliminating the need for divers.

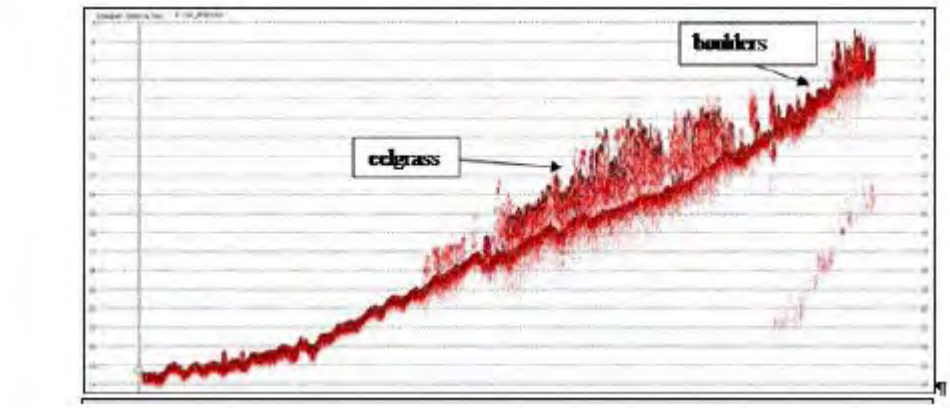


Figure 31- Example Eelgrass Echograph

Eelgrass Assessment Results

A full copy of the Megalodon report is included as an attachment to this report. Based on Megalodon's observations and the data collected, it is their opinion that the Town can relocate the Pier to a new location along Fisherman's Beach or rebuild in a similar footprint to the existing pier, as the pier will not affect existing eelgrass habitat. However, the Town is proposing to install a living reef, which may require they place large, submerged rocks, and/or ecologically sensitive concrete blocks to serve as an underwater jetty type structure and these nature-based resilience solutions need to be placed in areas to avoid eelgrass habitat. The western portion of the proposed project area does not show ground-truthing that suggests eelgrass is present and it is within this location that Megalodon recommends placing these submerged structures, if any. Should the Town decide to place these submerged structures within the area defined as potential eelgrass habitat then we recommend site-specific and finer-scaled delineation take place using underwater divers to determine if an area is devoid of eelgrass. The result of this study suggests that the 2016 MADEP eelgrass mapping area is not of sufficient resolution to identify the full extent of potential eelgrass habitat in the area; however, the majority of Megalodon's data are of sufficient resolution and quality to support project decisions.

The Need for Resiliency

As has become very apparent in the past several years, our planet's climate is changing. The frequency and severity of storms are increasing with time and the oceans are responding to climate change with rising tides and higher water levels that now flood an increasing cross section of the coastal lowlands as

part of the daily tidal cycle. Swampscott is a coastal community with a large cross-section of low-lying landscape and assets located adjacent to the ocean. With its long coastline, the town is on the frontline of global climate change. Higher tides and coastal damage as a result of increasing storms and severe weather is affecting the Town. These trends show increasing impacts from flooding, erosion, wave and water damage, storm surge, and waterfront degradation. Today, the Town is incorporating resilience into all of its planning and development efforts, and for this project, specifically, the focus is on adapting strategies and interventions for the pier and protecting the historic Fish House. This will positively impact the Fisherman's beach area ameliorate the effects of the encroaching ocean and storms on the downtown waterfront area.

Climate adaptation, once the realm of occasional interventions that typically took the form of monolithic hard-scape coastal structures – walls that cut off communities from the environment and split neighborhoods into unconnected segments - has morphed over time into strategies that stress working with nature and building with the environment. Today the approach is to create resilient systems that leverage the natural landscape's ability to absorb extreme events, playing to the strength and flexibility of the environment and resulting in more resilient outcomes through designs that work with nature. The modern approach to coastal resilience engenders a spirit of cooperation with the natural landscape –sculpting the land to take advantage of the attributes of natural systems that control water flow and surge and creating an aesthetic landscape that provides protection from the storm and from the encroachment of water along the coastline due to climate-driven sea level changes.

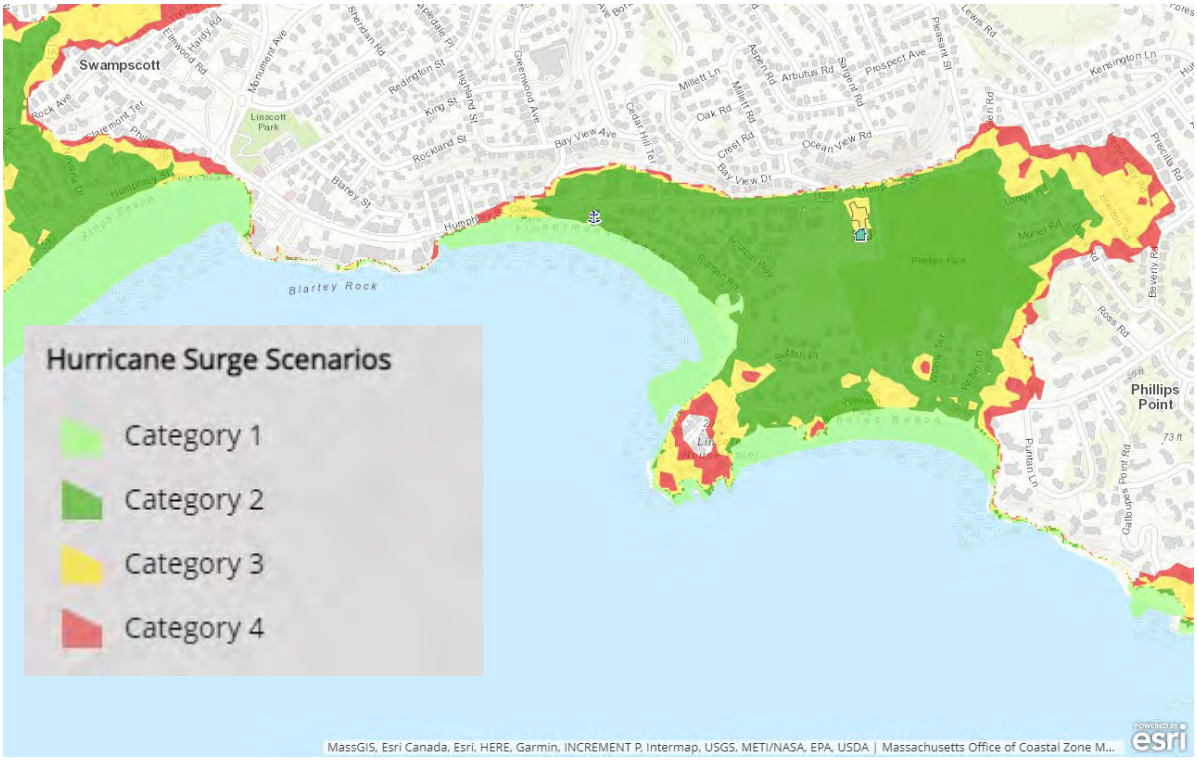


Figure 32- Hurricane Surge Modeled Scenarios

The road to the modern resiliency approach incorporates a full range of human historical experience, from early reactions to environmental events that involved retreating from the problem areas to the concept of letting-it-happen-and-rebuilding-with-same-after, to walling off the problem, to the

contemporary approach involving engineered solutions coupled with the strategy of working with nature. One central tenant of a newer approach is the concept of *building for the norm as well as the storm*. This approach embraces the concept of creating resilient interventions that protect coastal communities when there is a storm or event, while at the same time improving the utility and attractiveness of the landscape to encourage and improve community use on a daily basis when there is not a storm. The thinking around resilience shifted to working with the natural environment to create healthier, more useful, and protective interventions. A broad range of engineered solutions was developed to support resiliency efforts for all coastal situations – from urban to natural greenfield, and suburban to degraded brownfield. Many interventions were patterned after the innovative approaches taken in the Netherlands, a country that exists with nearly its entire landscape below sea level.

Interventions range from concepts that are applied to the direct interface between the upland and the ocean to reduce the impacts of storm surge and wave action, to concepts that create stormwater storage or conveyance that reduce the compounding effects of flooding from heavy rain events where upland water overwhelms the stormwater systems of traditional engineered solutions. Examples include:

Living Shorelines and Living Reefs – developing resilience along the interface between the land and the water through the building of marsh, reef, and dune structures out of natural plant, sediment, and soil materials.

Sculpting the landscape – developing berms and high and low areas that act as a system to keep water out, directing water to safe holding structures, and creating natural wetlands and coastal marshes to store water and reduce erosional action.

Blue-Green waterparks – which act as water storage systems during high water times and are open green space which can be used by the community when the water levels recede.

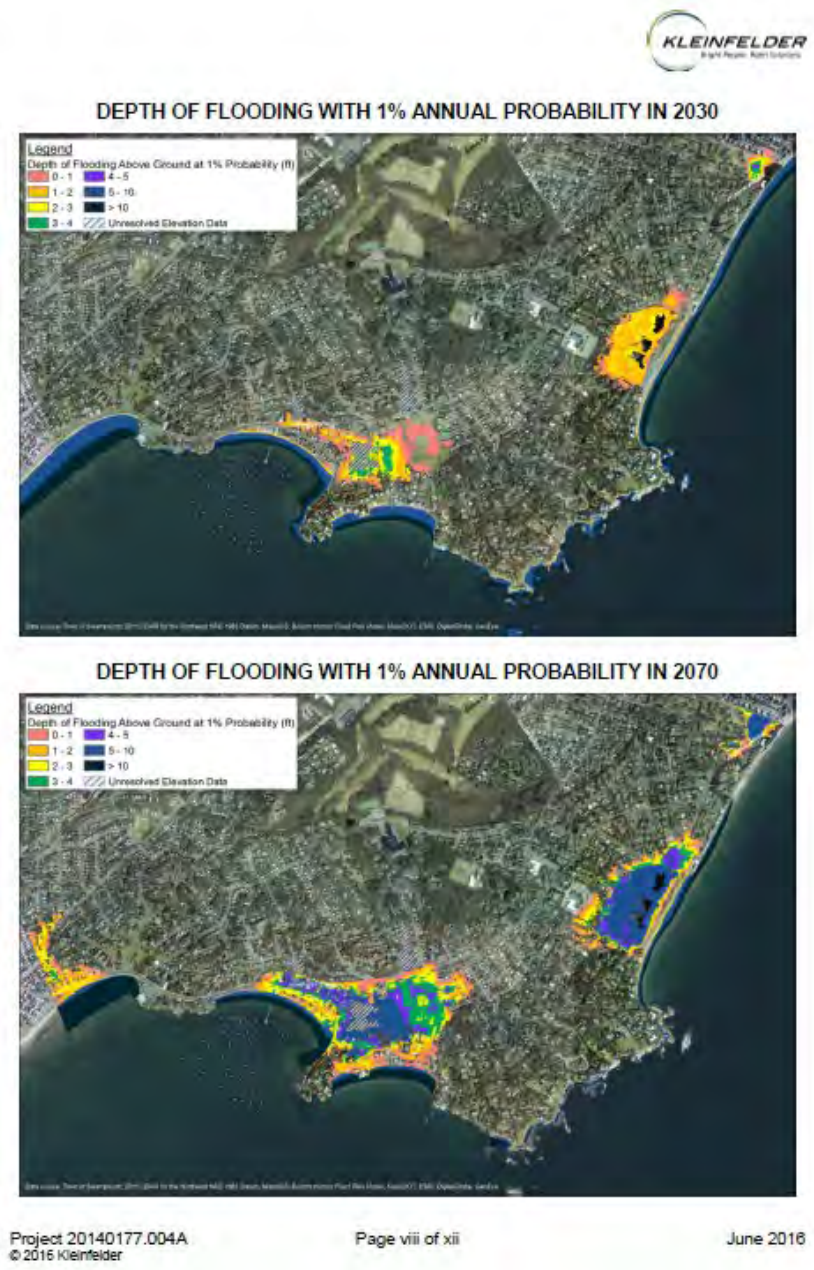


Figure 33 -Flooding Probability Maps from Swampscott Hazard Mitigation Plan

Process. The process of determining the appropriate interventions and strategy for resilience for the study area included the following steps: assess historic conditions; assess current conditions; take measurements of the landscape; review the results of predictive models to provide context for future conditions; identify intervention types that would have the highest likelihood of success; identify the location, size, and layout of interventions that would have the highest chance of creating resilience and reducing storm impacts and impacts from daily tidal cycles; and integrate those designs into the overall use, landscape, and aesthetic designs being developed as part of the master plan for the area. One key resource for this effort was the 2016 study entitled "Coastal Climate Change Study Final Report" prepared by Kleinfelder. Other data points we reviewed include:

- Historic conditions – maps and accounts of flooding over the past 20 years were identified and reviewed, forming a baseline for condition projections.
- Current conditions - measurements of the landscape were obtained and a base map of existing conditions was created on which overlays of interventions and strategy concepts could be made.
- Predictive models – showing likelihood and severity of flooding and storm damage from storm scenarios that ranged from minor to severe were reviewed. A storm condition that was considered reasonable for future conditions was selected as the design storm condition.
- Potential intervention types were identified which would have the highest likelihood of success, including the identification of the location, size, and layout of interventions that would have the highest chance of creating resilience and reducing storm impacts and impacts from daily tidal cycles; and
- Integration of those high likelihood of success designs into the overall use, landscape, and aesthetic designs being developed as part of this feasibility plan for the area.

Potential Resiliency Approaches

Based on our review of the situation surrounding the pier and the Fish House, we identified a couple of resiliency strategies that could be implemented along with the redevelopment of the Pier. These strategies include:

1. Elevate the Deck of the Pier – The existing pier height is too low and is subjected to significant impact from coastal storms, particularly out of the southeast. If the redeveloped pier is raised between four to six feet (depending on surrounding grades), the pier structure (specifically the stringers and decking) would be less subjected to impact from wave action and tidal surge, helping to extend the longevity of the structure and increase its resilience. Furthermore, an elevated structure will have less shading impacts along the harbor bottom, which leads to the second strategy.
2. Avoid and Minimize Impacts to Eelgrass Beds – The eelgrass beds are a protected resource and a natural buffer against tidal surge. While they provide habitat for marine life along the seabed, they also help to buffer and reduce wave energy associated with storm surge in open waters. We recognize that the eelgrass is present in varying locations throughout the Harbor and changes over seasons, and therefore complete avoidance is not feasible; however, minimizing those impacts by raising the structure, orienting the structure in a north-south fashion, and plantings/replicating eelgrass beds to offset any temporary impacts associated with the development of the new pier.
3. Using the landscape to protect the Fish House – In this coastal environment, oftentimes hard structures have additional unforeseen impacts in other areas of the coast, such as interfering with sediment movement or deflecting wave energy to another location. To avoid these unintended impacts, we have looked to using the landscape and natural materials to protect the Fish House. This would take the shape of creating a reinforced sand berm, planted with native seagrasses around the Fish House. This berm would have a shallow slope which is reinforced with jute matting and the roots of the seagrass, which would allow for sediment movement along the bank but still provide protection around the Fish House. The Berm would keep a constant elevation from Chiasson Park along the edge of the parking lot, to the reconstructed boat ramp, which would connect to a second berm wrapping around to the easterly ramp, which would be reconstructed as well.

There are also other conversations beyond the scope of this study that need to be taken into account for protecting the Fish House. That includes the possibility of elevating the structure and/or relocating it. Given that the Fish House is on the National Register of Historic Places, there needs to be an open conversation throughout the community, with regulators and historical commission officials included in the conversation.

Pier Goals and Considerations

The level of success of the redevelopment and upgrading of the Pier will be judged by both project goals and considerations. Upgrades and redevelopment of the municipal Pier are being pursued with four goals in mind:

1. Creating Resiliency – Providing resiliency to the Pier and to the Fish House;
2. Serving the Community – Allowing for emergency access, and serving all users of the community;
3. Benefitting the Local Economy – Supporting the local fishing fleet and allowing for future expansion and uses; and,
4. Supporting Tourism in the Area – Creating a venue that supports the local business downtown and draws people into the area.

In addition to meeting the project goals, all potential layouts need to be gauged against certain considerations that will affect the viability of a project:

1. Permitting difficulty – Factoring in the coastal and natural resources of the area, in particular the eelgrass beds that exist within the Harbor.
2. Construction Costs – The project funding will likely come from a mix of grants, loans, and local match, and thus any potential project will need to have a justifiable benefit-cost balance.
3. Operations and Maintenance Costs – Considering the lifecycle of the proposed upgrades, the project shouldn't pose undo or burdensome operations and maintenance activities.
4. Impacts on Existing Harbor Users – The project shouldn't displace or have a negative impact on existing users of the harbor.

Pier Layout Alternatives Evaluation

To determine the optimal layout for the Pier, the MME team evaluated several different options and gauged these options against the criteria set forth in the project goals and the project considerations. The alternatives reviewed were:

1. T**he Do-Nothing Alternative** – No change to the existing infrastructure and layout is made. This is the baseline comparison purpose required as part of permitting. Doing nothing will result in the continued deterioration of the Pier and eventual failure of Pier elements, resulting in a rendering of the Pier as unsafe.
2. **Concept Plan 1** – A rebuilt pier generally along the same footprint of the existing pier, but raised in elevation, widened to 12 feet, with bumpouts and a ramp to allow emergency vehicle access.
3. **Concept Plan 2** – A new 24 foot wide by 466-foot-long pier that begins in the middle of the parking area and lands near the end of the existing pier location (existing pier to be demolished).

4. **Concept Plan 3** – A new 12 foot wide by 538-foot-long pier that starts at the park west of the existing parking area and lands near the end of the existing pier location (existing pier to be demolished).
5. **Concept Plan 4** – A new 18 foot wide by 670-foot-long pier with bumpouts that starts at the park west of the existing parking area and lands due south into deeper water (existing pier to be demolished).
6. **Concept Plan 5** – A new 24 foot wide by 441-foot-long pier that runs parallel with the existing pier (existing pier to be demolished).
7. **Concept Plan 6** – A new 24 foot wide by 695-foot-long pier with a bumpout and turning point at the end, leaving from the western edge of the parking area and heading past the end of the existing pier into deeper water (existing pier to be demolished).
8. **Concept Plan 7** – A new 25 foot wide by 665-foot-long pier with separate vehicle and pedestrian access and turning point at the end. The pier would leave from west of the existing parking area and land past the end of the existing pier into deeper water (existing pier to be demolished).

Alternatives Analysis

Alternative 1- The Do-Nothing Alternative

This first alternative, called the Do-nothing or No action alternative as shown on the Existing Conditions plan, looks at the Pier from the perspective of what if no action is taken. This is a required component of the permitting effort.

Figure 34 - Existing Pier Layout

Resiliency: This option provides no improved resiliency to the Pier or Fish House, leaving them both vulnerable to rising seas and storm surge, particularly from storms out of the southeast.

Community: This option would maintain but not expand service to existing users with only pedestrian access to the Pier and would not allow for emergency services access**.**

Economy: This option does nothing to increase support for local fishermen, nor does it allow for future expansion of activities associated with the Pier.

Tourism: This option does nothing to increase tourism and support local businesses.

Permitting: With respect to permitting this alternative, the requirements are straightforward, in that no new permit requirements will be required. Eventual failure of the Pier will require removal (for public safety reasons), which will require demolition and environmental permits.

Construction: With respect to ease of design and construction, again, this alternative represents the easiest path as no new effort is required.

Operations and Maintenance: Maintenance requirements for this alternative are the same as they have always been, sidewalks need to be maintained and plowed, public infrastructure maintained for structural integrity, etc. Continued degradation of the Pier will require extensive maintenance of piling, cross member, decking, and footing components. Erosion of base foundational soils and sand will allow for Pier elements to slump and eventually fail.

Impacts on Existing Harbor Users: This alternative has no impact on existing users; however, as the Pier continues to deteriorate and the harbor shoals up from sedimentation, access and use of the Harbor will decrease.

Alternative 2- Concept Plan No. 1

Figure 35 - Concept Plan No. 1

This alternative involves a rebuilt pier generally along the same footprint of the existing pier (441 foot long), but raised in elevation approximately elevation 12, widened to 12 feet, with bumpouts and a ramp to allow emergency vehicle access. A new concrete boat ramp will be installed to the west of the existing one and extended out to elevation -2 MLLW to allow for launching at lower ends of the tide cycle. A reinforced sand dune berm would run parallel with the emergency vehicle ramp up to the pier to provide resiliency for the Fish House. The floating wave attenuator docks are added at the end to protect part of the Pier and Harbor and allow for use in place of the existing float system.

Resiliency: This option provides resiliency protections to the Fish House by proposing a sand dune planted with native beach grasses that will provide a natural landscape protection against storm surge. The Pier's resiliency elements will include raising the deck elevation and implementing floating dock wave attenuators at the end to cut down waves from storm surge.

Community: This option would allow for emergency access with a ramp from the parking area up to the new Pier**.** Further use to other users will be improved with the bumpouts to allow for more leisure access and use that would not impede on those going out or coming in from the existing Pier. The widened Pier will allow for two-way pedestrian traffic, which is currently limited.

Economy: This option, due to the width, would need a conveyor or some other system to better support local fisherman. Future expansion of activities associated with the Pier are very limited with this layout.

Tourism: This option creates a marginal improvement to increase tourism and support local businesses. By providing a wider Pier, more users could comfortably take advantage and therefore increase traffic in the downtown waterfront area.

Permitting: Permitting this concept will be rigorous, however the concept approximates the layout of the existing Pier and does not drastically differ. The concrete wave attenuators, if too large, may receive pushback from regulators for causing shading on the bottom and thus potentially impacting eelgrass. Considering the upgrades to the structure, resiliency improvements, and community benefits, this layout is likely to have a straightforward permitting path, provided the final design respects the environmental performance standards and provides protections and mitigation where necessary.

Construction: Given that the footprint of this concept is overlain on the existing pier, there are some logistical challenges associated with the construction of this concept, and there will be a time when no Pier structure will be available for public use. All of the concepts envision a pile-supported structure; however, this layout would have the existing pilings in the way. Typically abandoned timber piles are cut off at the mudline because pulling them is difficult and costly, however pilings left in place could cause problems for the new Pier. It may be more efficient to construct this option parallel with the existing structure and then take down the existing structure once completed.

Operations and Maintenance: Maintenance requirements for this alternative will be dictated largely by the materials chosen for use.

Impacts on Existing Harbor Users: This alternative will have a significant short-term impact on existing users, as the existing Pier will need to be removed in order to allow for the construction of the new Pier. Once constructed, this alternative will not negatively impact existing users, but will provide minimal improvement with minimally the same or slightly easier boat launch access.

Alternative 3- Concept Plan No. 2

Figure 36 - Concept Plan No. 2

This alternative involves the installation of a new Pier that runs north-south with its headlands at the center of the existing parking area and is approximately 466 feet long . This proposed Pier raised in elevation approximately elevation 12, widened to 24 feet. A new concrete boat ramp will be installed to the west of the existing ramp and to the west of the pier and extended out to elevation -2 to allow for launching at lower ends of the tide cycle. A reinforced sand dune berm would run parallel with the emergency vehicle ramp up to the Pier to provide resiliency to the Fish House. The floating wave attenuator docks are added at the end to protect part of the Pier and harbor and allow for use in place of the existing float system.

Resiliency: This option provides resiliency protections to the Fish House by proposing a sand dune planted with native beach grasses that will provide a natural landscape protection against storm surge. The Pier's resiliency elements will include raising the deck elevation and implementing floating dock wave attenuators at the end to cut down waves from storm surge.

Community: This option would allow for emergency access with a ramp from the parking area up to the new Pier**.** The widened Pier will allow for two-way pedestrian traffic and allow for commercial/emergency vehicle access at the same time.

Economy: This option would allow truck access for the commercial fisherman to drive out to the gangway. Dock floats will be accessible the majority of the day /operating hours. While the intent is to

provide all-day year-round access for all vessels, there will remain a small window around low tide where some deeper draft vessels may not have access to the floats. Without a bumpout or turnaround area, vehicle access would have difficulties as user would be required to back out in reverse or conduct a multiple point turn to head back off the pier.

Tourism: This option creates a marginal improvement to increase tourism and support local businesses. By providing a wider Pier, more users could comfortably take advantage and therefore increase traffic in the downtown waterfront area.

Permitting: Permitting this concept, like most of the concepts, will require environmental and resource assessment and will involve minimization of negative habitat impact and/or mitigation. Starting at a new headlands will impact decisions and regulators inputs. Pile driving has environmental impacts (albeit temporary) and thus will likely be restricted to certain times of year and under certain conditions. The concrete wave attenuators, if too large, may receive pushback from regulators for causing shading on the bottom and thus potentially impacting eelgrass. The raised deck elevation and the north-south orientation will be favorable to minimizing impacts to the eelgrass. Mitigation designs to offset both temporary and permanent impacts will be necessary.

Construction: This option represents a standalone structure, separate from the Fish House, so staging and pile driving access upland will be more straightforward than near the Fish House alternatives. The wider structure will be more expensive to implement than a narrower structure. Access to the shallow areas, particularly in the long intertidal area for pile driving will be tidal dependent and thus more expensive than areas that are either entirely upland or entirely submerged. The existing Pier can remain in place until this one is constructed.

Operations and Maintenance: Maintenance requirements for this alternative will be dictated largely by the materials chosen for use.

Impacts on Existing Harbor Users: This alternative will not negatively impact existing users; however, it will likely displace a couple of existing moorings. There will be an improvement in allowing easier boat launch access. This design will also remove existing parking spaces in the middle and end of the parking lot.

Alternative 4- Concept Plan No. 3

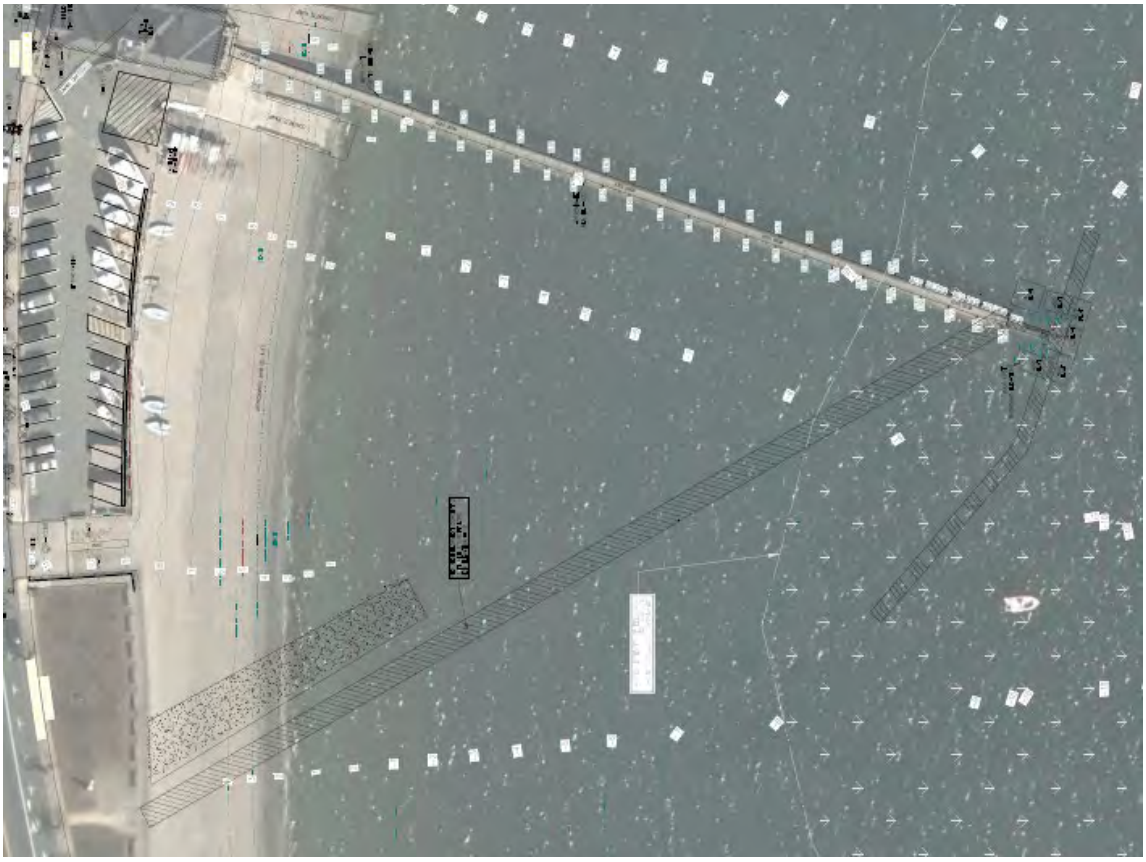


Figure 37 - Concept Plan No. 3

This alternative involves the construction of a new Pier with its headlands much further to the west by the existing park and running southeasterly towards the existing floats. The proposed Pier would be 538 feet long and at an approximately elevation 12 and is 12 feet wide. A new concrete boat ramp will be installed to the east of the Pier and extended out to elevation -2 MLLW to allow for vessel launching at lower ends of the tide cycle. The floating wave attenuator docks are added at the end to protect part of the Pier and Harbor and allow for use in place of the existing float system.

Resiliency: The Pier's resiliency elements will include raising the deck elevation and implementing floating dock wave attenuators at the end to attenuate waves from storm surge.

Community: This option would allow for emergency access with a connection to Humphrey Street, through the park area and directly onto the Pier. The Pier width will allow for two-way pedestrian traffic, and emergency vehicle access; however, there is no provision provided for the emergency vehicles to turn around, thus they would have to back up the entire length of the Pier.

Economy: This option would have minimal to no economic impact on the fishing fleet. The location is far away from their lockers at the Fish House and, given the width and lack of turn around space, it is unlikely they would use the pier for loading and unloading equipment and their catches.

Tourism: This option creates a marginal improvement to increase tourism and support local businesses. By providing a wider Pier, more users could comfortably take advantage and therefore increase traffic in the downtown waterfront area.

Permitting: Permitting this concept, like most of the concepts, will be rigorous. Starting at a new headlands will impact decisions and regulators inputs. Pile driving has environmental impacts (albeit temporary) and thus will likely be restricted to certain times of year and under certain conditions. The concrete wave attenuators, if too large, may receive pushback from regulators for causing shading on the bottom and thus potentially impacting eelgrass if there are pockets that develop along the alignment. The raised deck elevation will be favorable to minimizing impacts to the eelgrass. Mitigation designs to offset both temporary and permanent impacts will be necessary.

Construction: This option represents a standalone structure, separate from the Fish House, so staging and pile driving access upland will be more straightforward than near the Fish House location. Because the existing park area is at a higher elevation, this Pier structure would require less of a ramp up from Humphrey Street to meet final grade and thus be less dramatic and easier to construct. The wider structure will be more expensive to implement than a narrower structure. Access to the shallow areas, particularly in the long intertidal area for pile driving will be tidal dependent and thus more expensive than areas that are either entirely upland or entirely submerged. The existing Pier can remain in place until this one is constructed.

Operations and Maintenance: Maintenance requirements for this alternative will be dictated largely by the materials chosen for use.

Impacts on Existing Harbor Users: This alternative will not negatively impact existing users; however, it will likely displace a couple of existing moorings. There will be an improvement in allowing easier boat launch access.

Alternative 5- Concept Plan No. 4

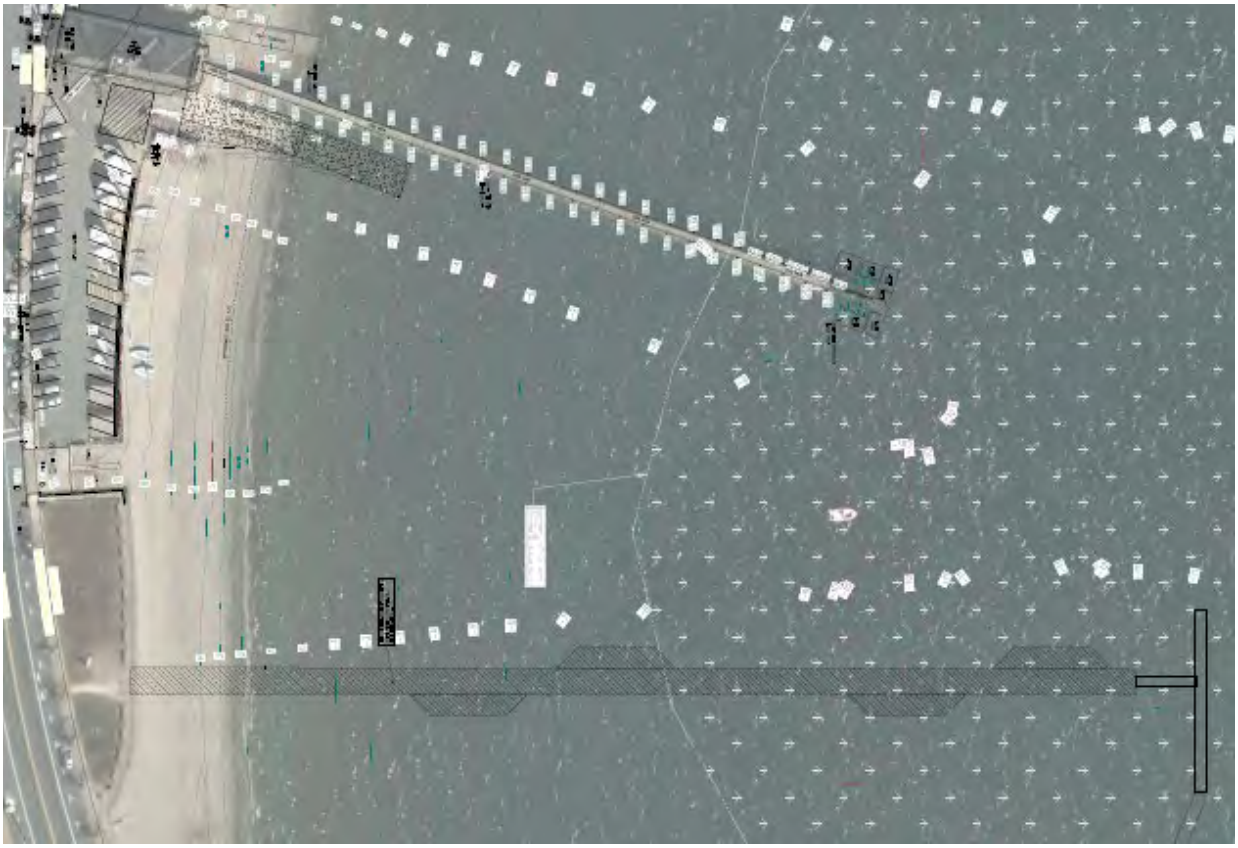


Figure 38 - Concept Plan No. 4

This alternative involves the installation of a new Pier with its headlands much further to the west by the park and running north-south into slightly deeper water with a new landing area. The proposed Pier would be 670 feet long and raised in elevation approximately elevation 12 and 18 feet wide with several bumpout areas to allow for more recreational opportunities. A new concrete boat ramp will be installed in the footprint of the existing ramp but extended out to elevation -2 MLLW to allow for vessel launching at lower ends of the tide cycle. The floating wave attenuator docks are added at the end to protect part of the Pier and Harbor and allow for use in place of the existing float system.

Resiliency: The Pier's resiliency elements will include raising the deck elevation and implementing floating dock wave attenuators at the end to cut down waves from storm surge.

Community: This option would allow for emergency vehicle access with a connection to Humphrey Street, through the park area and directly onto the Pier. The Pier with would allow for two-way pedestrian traffic, and emergency vehicle access. The bumpouts would allow for emergency vehicles to turn around.

Economy: This option would have beneficial impact for the fishing fleet as it would allow direct vehicular access on the Pier. However, the limited width and the location of the Pier on the far side of the Town property from the Fish House provide for only limited advantage for the fishing fleet and falls short of the goal of providing significantly better access for the fishing fleet. Additional improvement to the Pier would be required to improve its utility for the fishing fleet.

Tourism: This option creates some improvement to increase tourism and support local businesses. By providing a wider Pier, more users could comfortably take advantage and therefore increase traffic in the downtown waterfront area. There would be opportunities for pop-up stands and kiosks in the bumpout areas.

Permitting: Permitting this concept, like most of the concepts, will be rigorous. Starting at a new headlands will impact decisions and regulators inputs. Pile driving has environmental impacts (albeit temporary) and thus will likely be restricted to certain times of year and under certain conditions. The concrete wave attenuators, if too large, may receive pushback from regulators for causing shading on the bottom and thus potentially impacting eelgrass. The north-south orientation and raised deck elevation will be favorable to minimizing impacts to the eelgrass. Increasing the length of the Pier will also be heavily scrutinized and will need to be justified. Mitigation designs to offset both temporary and permanent impacts will be necessary.

Construction: This option represents a standalone structure, separate from the Fish House, so staging and pile driving access upland will be more straightforward than near the Fish House location. Because the existing park area is at a higher elevation, this Pier structure would require less of a ramp up from Humphrey Street to meet final grade and thus be less dramatic and easier to construct. The wider structure will be more expensive to implement than a narrower structure. Access to the shallow areas, particularly in the long intertidal area for pile driving will be tidal dependent and thus more expensive than areas that are either entirely upland or entirely submerged. The existing Pier can remain in place until this one is constructed.

Operations and Maintenance: Maintenance requirements for this alternative will be dictated largely by the materials chosen for construction.

Impacts on Existing Harbor Users: This alternative will not negatively impact existing users; however, it will likely displace a couple of existing moorings. There will be an improvement in allowing easier boat launch access.

Alternative 6- Concept Plan No. 5

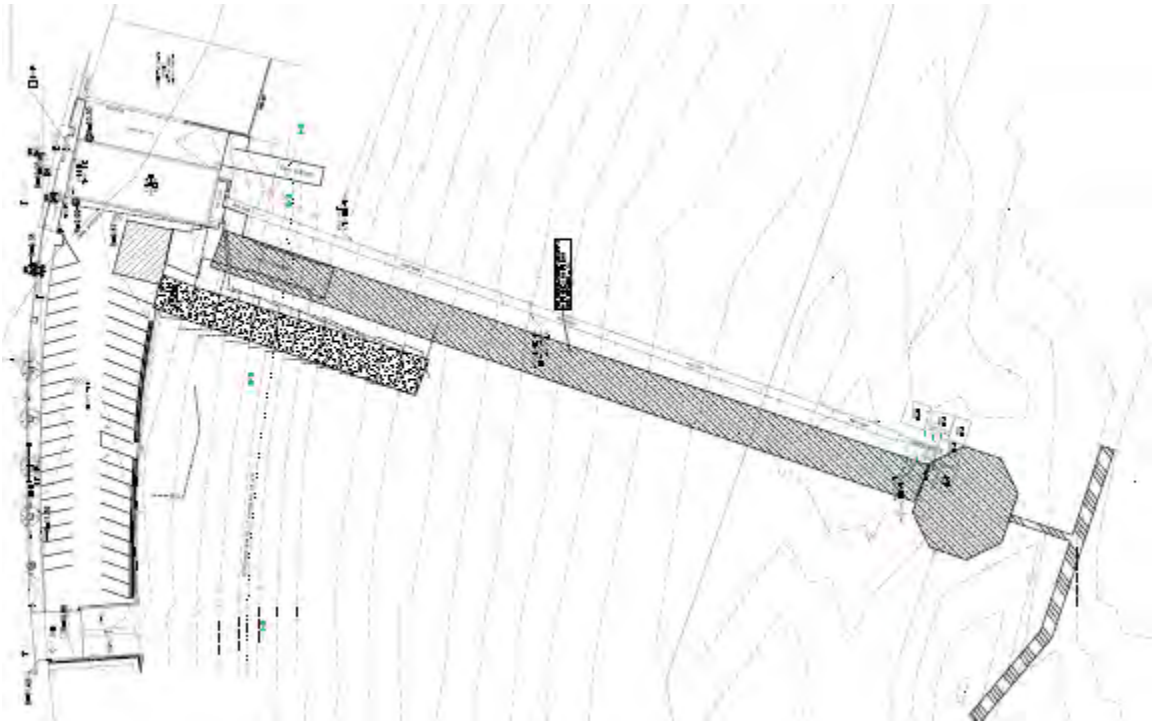


Figure 39- Concept Plan No. 5

This alternative involves the installation of a new pier parallel to the existing pier. The proposed pier would be 441 feet long and raised in elevation approximately elevation 12 and be 24 feet wide. A new concrete boat ramp would be installed in the footprint of the existing ramp but extended out to elevation -2 MLLW to allow for vessel launching at lower ends of the tide cycle. The floating wave attenuator docks are added at the end to protect part of the pier and harbor and allow for use in place of the existing float system.

Resiliency: The Pier's resiliency elements will include raising the deck elevation and implementing floating dock wave attenuators at the end to cut down waves from storm surge.

Community:

This option would allow for emergency access through the existing parking area for the Beach and directly onto the Pier. The Pier with will allow for two-way pedestrian traffic, and emergency vehicle access, and the octagonal area at the end of the pier would allow emergency vehicles to turn around.

Economy: This option would result in a positive logistical impact to the fishing fleet. The location is adjacent to the existing fishermen's lockers at the Fish House, which is a positive; In addition, given the width and turn-around area, fishermen could use a vehicle to access the Pier for loading and unloading equipment and their catches.

Tourism: This option creates some improvement to increase tourism and support local businesses. By providing a wider Pier, more users could comfortably take advantage and therefore increase traffic in

the downtown waterfront area. The octagonal area is large enough to host pop-up stands, kiosks, etc. that could benefit and promote activity in the downtown area.

Permitting: Permitting this concept, like most of the concepts, will be rigorous. Pile driving has environmental impacts (albeit temporary) and thus will likely be restricted to certain times of year and under certain conditions. The concrete wave attenuators, if too large, may receive pushback from regulators for causing shading on the bottom and thus potentially impacting eelgrass. Mitigation designs to offset both temporary and permanent impacts will be necessary.

Construction: This option would allow the existing Pier to remain in place and is relatively straightforward when compared to some of the other options. Access to the shallow areas, particularly in the long intertidal area for pile driving, will be tidal dependent and thus more expensive than areas that are either entirely upland or entirely submerged. The existing Pier can remain in place until this one is constructed.

Operations and Maintenance: Maintenance requirements for this alternative will be dictated largely by the materials chosen for use.

Impacts on Existing Harbor Users: This alternative will not negatively impact existing users. There will be an improvement in allowing easier boat launch access.

Alternative 7- Concept Plan No. 6

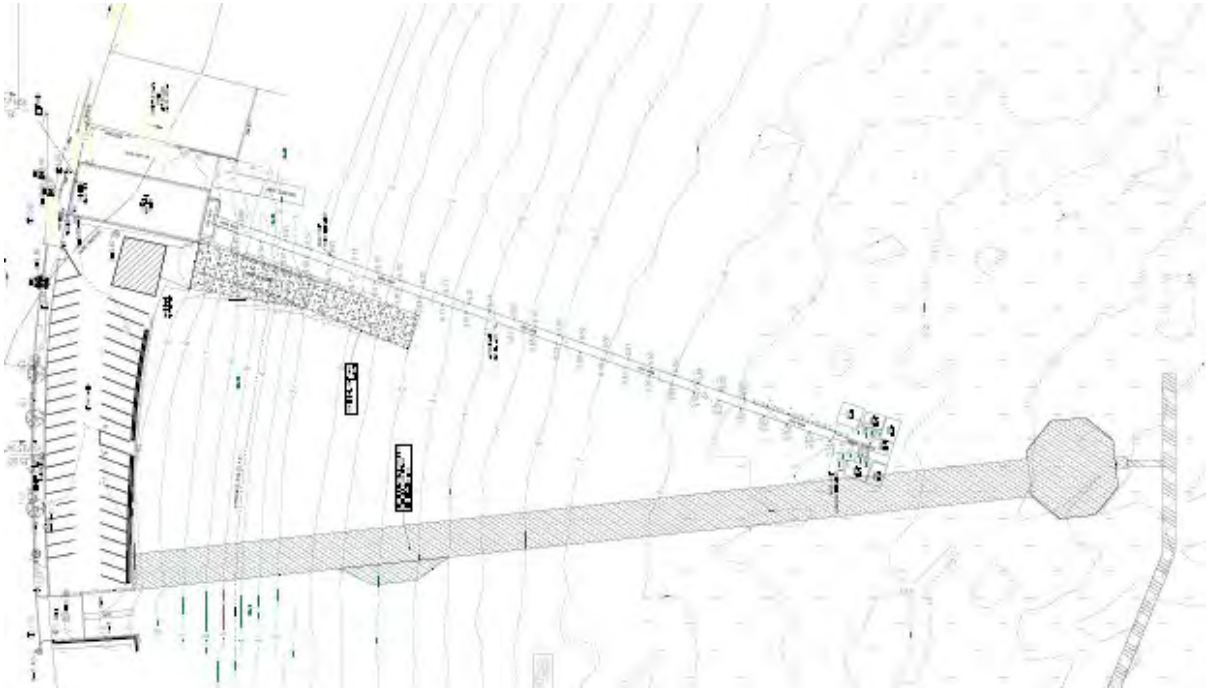


Figure 40- Concept Plan No. 6

This alternative involves the installation of a new Pier with its headlands at the western edge of the Fisherman's beach parking area (or it could go just beyond that) and running north-south into slightly deeper water with a new landing area. The proposed Pier would be 695 feet long and pier raised in elevation approximately elevation 12 and be 24 feet wide with a bumpout and a hexagonal area at the end. A new concrete boat ramp will be installed in the footprint of the existing ramp but extended out

to elevation -2 MLLW to allow for vessel launching at lower ends of the tide cycle. The floating wave attenuator docks are added at the end to protect part of the pier and harbor and allow for use in place of the existing float system.

Resiliency: The Pier's resiliency elements will include raising the deck elevation and implementing floating dock wave attenuators at the end to attenuate waves from storm surge.

Community: This option would allow for emergency access through the parking area and directly onto the Pier. The Pier width will allow for two-way pedestrian traffic, and emergency vehicle access. The bumpouts and hexagonal ending will allow for emergency vehicles to turn around.

Economy: This option would have a positive logistical impact to the fishing fleet. While the location is further away from the lockers at the Fish House, the Pier width and availability of a turn-around make it vehicle accessible, thus providing significantly easier access and equipment loading and catch unloading. Fishermen could use the Pier for loading and unloading equipment and their catches. It would also be vehicle accessible from the parking lot, making a more direct connection to users on the west side of the Fish House.

Tourism: This option creates some improvement to increase tourism and support local businesses. By providing a wider Pier and the hexagonal ending area, more users could comfortably take advantage of the Pier and therefore increase traffic in the downtown waterfront area. The Pier and hexagonal ending could be used to host food trucks or other items/events that would encourage the public to venture out over the water.

Permitting: Permitting this concept, like most of the concepts, will be rigorous. Starting at a new headlands will impact decisions and regulators inputs. Pile driving has environmental impacts (albeit temporary) and thus will likely be restricted to certain times of year and under certain conditions. The concrete wave attenuators, if too large, may receive pushback from regulators for causing shading on the bottom and thus potentially impacting eelgrass. The north-south orientation and raised deck elevation will be favorable to minimizing impacts to the eelgrass. Extension of the length of the Pier will also be heavily scrutinized and will need to be justified. Mitigation designs to offset both temporary and permanent impacts will be necessary.

Construction: This option represents a standalone structure, separate from the Fish House, so staging and pile driving access upland will be more straightforward than near the Fish House location. Because the existing park area is at a higher elevation, this Pier structure would require less of a ramp up from Humphrey Street to meet final grade and thus be less dramatic and easier to construct. The wider structure will be more expensive to implement than a narrower structure. Access to the shallow areas, particularly in the long intertidal area for pile driving will be tidal dependent and thus more expensive than areas that are either entirely upland or entirely submerged. The existing Pier can remain in place until this one is constructed.

Operations and Maintenance: Maintenance requirements for this alternative will be dictated largely by the materials chosen for use.

Impacts on Existing Harbor Users: This alternative will not negatively impact existing users; however, it will likely displace a couple of existing moorings. There will be an improvement in allowing easier boat launch access. This design will also remove existing parking spaces at the end of the parking lot.

Alternative 8- Concept Plan No. 7

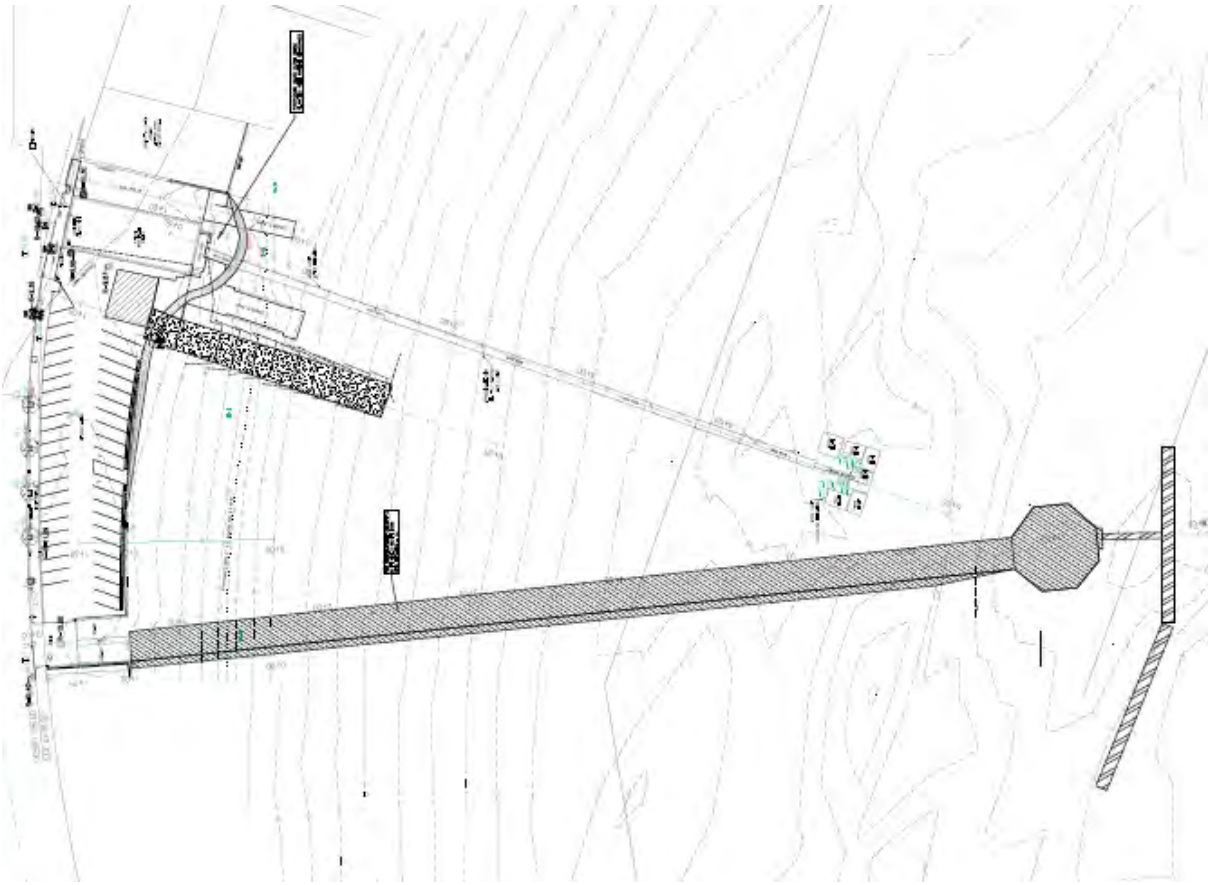


Figure 41 - Concept Plan No. 7

This alternative involves the creation of a new Pier with its headlands located just past the western edge of the Fisherman's beach parking area and running north-south into slightly deeper water with a new landing area. The proposed Pier is 665 feet long and raised in elevation approximately elevation 12 and is 25 feet wide with an octagonal area at the end. The increased width would allow dedicated two-way vehicle access as well a dedicated separated two-way pedestrian access. A new concrete boat ramp will be installed adjacent (to the east) of the new pier. It would be accessed at the western edge of the parking lot and extended out to elevation -2 to allow for launching at lower ends of the tide cycle. The floating wave attenuator docks are added at the end to protect part of the pier and harbor and allow for use in place of the existing float system.

Resiliency: The Pier's resiliency elements will include raising the deck elevation and implementing floating dock wave attenuators at the end to attenuate waves from storm surge.

Community: This option would allow for emergency access directly onto the Pier. The Pier width will allow for two-way pedestrian traffic, and two-way vehicle access. The octagonal ending will allow for emergency vehicles to turn around. The dedicated pedestrian area would prevent any conflict between pedestrians and emergency/commercial vehicles. Also, given the existing grades in the park and the proposed elevation of the pier, this option would have the easiest handicap accessibility, eliminating

need for ramps and/or switchbacks that may be needed for other options to provide access over a greater elevation difference.

Economy: This option would have a positive logistical impact for the fishing fleet. While, like the previous design, the Pier is slightly further away from the lockers at the Fish House, given the width and turn-around area, the fishermen could use a vehicle to access the Pier for loading and unloading equipment and their catches – significantly easing the burden of supplying fishing vessels and off-loading catch.

Tourism: This option creates some improvement to increase tourism and support local businesses. By providing a wider Pier, and the hexagonal ending area, more users could comfortably take advantage of the Pier and therefore increase traffic in the downtown waterfront area. The Pier and hexagonal ending could be used to host food trucks, pop-up stands and kiosks or other items/events that would encourage the public out over the water.

Permitting: Permitting this concept, like most of the concepts, will be rigorous. Starting at a new headlands will impact decisions and regulators inputs. The wide nature of this option will also merit review and scrutiny from regulators. Pile driving has environmental impacts (albeit temporary) and thus will likely be restricted to certain times of year and under certain conditions. The concrete wave attenuators, if too large, may receive pushback from regulators for causing shading on the bottom and thus potentially impacting eelgrass. The north-south orientation and raised deck elevation will be favorable to minimizing impacts to the eelgrass. Extension of the length of the Pier will also be heavily scrutinized and will need to be justified. Mitigation designs to offset both temporary and permanent impacts will be necessary.

Construction: This option represents a standalone structure, separate from the Fish House, so staging and pile driving access upland will be more straightforward than near the Fish House location. Because the existing park area is at a higher elevation, this Pier structure would require less of a ramp up from Humphrey Street to meet final grade and thus be less dramatic and easier to construct. The wider structure will be more expensive and robust to implement than a narrower structure. Access to the shallow areas, particularly in the long intertidal area for pile driving will be tidal dependent and thus more expensive than areas that are either entirely upland or entirely submerged. The existing Pier can remain in place until this one is constructed.

Operations and Maintenance: Maintenance requirements for this alternative will be dictated largely by the materials chosen for use.

Impacts on Existing Harbor Users: This alternative will not negatively impact existing users; however, it will likely displace most existing moorings in the Harbor. There will be an improvement in allowing easier beach vessel launch access.

Comparison of Alternatives

In order to compare each of the alternatives, we created an analysis matrix which ranks on a scale of 1-5 each of the 7 outcome criteria against each of the eight respective alternatives, including the “do nothing” alternative. Rankings can be used multiple times for the same criteria, as different alternatives may have very similar outcomes with respect to a particular criterion.

It is important to note that a lot of the design elements, such as bumpouts, crane lifts, turnaround areas, etc. can be interchanged and modified for the optimal layout in further design efforts. For the purposes of this analysis, we had to use a finite set of design features in order to highlight the preferred orientations and key features.

The result of this alternative analysis is present in Table 2:

Table 2
Alternatives Analysis Matrix

Alternatives are ranked on a scale of 1-5 with 1 being the least desirable outcome and 5 being the most desirable outcome

Swampscott Town Pier
Project Goal Matrix

Alternatives are ranked on a scale of 1-5 with 1 being the least desirable outcome and 5 being the most desirable outcome

Goals		**Do-Nothing**	**Concept 1**	**Concept 2**	**Concept 3**	**Concept 4**	**Concept 5**	**Concept 6**	**Concept 7**
Resiliency	Resilience of the Pier	1	3	3	3	4	4	4	4
	Resilience of the Fish House	1	3	4	4	4	4	4	4
Community	Serve all users	2	3	4	3	4	4	4	5
	Allow for emergency access	1	3	5	3	5	5	5	5
Economy	Support local fisherman	1	3	4	3	3	4	4	4
	Allows for future expansion	1	3	3	3	3	2	4	5
Tourism	Support local businesses	1	3	3	3	3	3	4	4
Project Considerations									
	Permitting Difficulty	5	4	3	3	2	4	2	2
	Construction Costs	5	4	3	3	2	4	2	2
	O&M Costs	5	4	4	3	3	4	3	2
	Impacts on Existing Harbor Uses	3	4	4	4	4	3	4	4
Total Score		**26**	**37**	**40**	**35**	**37**	**41**	**40**	**41**

As can be seen in Table 2, **Alternatives 5 and 7 outrank** the other six alternatives.

Engineering Considerations

In order to move the project forward, continued engineering design activities will be required (the design work to date has been of sufficient detail to provide data for this FS as well as initiate preliminary discussions with resource regulatory community) to build upon the efforts conducted in this FS. During the next phase of design (e.g., 60% design package), the following project components will be required:

- Additional geotechnical investigations would need to be conducted;
- A structural/seismic design; and,
- Additional details on the layout of the pier, boat ramp and resiliency interventions associated with this project.

The next phase of design will note construction materials, necessary upgrades and infrastructure improvements, signage and security considerations, as well connections into the abutting areas. It should be noted that the primary purpose of this FS is to identify the preferred Pier alternative, vet it with the regulatory community, and then allow the conduct of the above-referenced targeted work-flow component to result in a rigorous, permittable and cost-effective design.

With the updated design drawings and details, the Pier Redevelopment project can move forward into the next phase of work, which will include additional data gathering, field work, and the development of a permitting strategy of the project, allowing the design process to move toward the 30% design phase. On the regulatory front, a selected design will advance to a position whereby regulators will be able to begin the review process and provide input into the proposed designs. In future phases of work, and after permitting is completed, final design efforts will occur and then the project will be ready to move into procurement and construction phases.

Material Considerations

The upgraded Pier will need to be constructed of materials that are adapted to the marine environment where they will stand up to and support the loads and design stresses that will occur on such a structure, as well as perform well in the highly active marine environment. There are several typical materials used in similar waterfront structures, each with their own advantages and drawbacks. The most common of these materials, with descriptions adapted from PIleBuck Magazine,[3] include the following:

Wood/Timber

Timber is often used in the construction of light-duty piers and wharves. It is not typically used for major functional piers and wharves, such as berthing, repairs, and supply facilities that are subject to highly concentrated wheel and lateral loads. Timber is best reserved for use in fender systems, dolphins, walkways, and deck-supported small buildings.

Concrete

Concrete is often the top option for pier and wharf construction given its durability in the marine environment. Unlike other materials, concrete is not susceptible to marine borers or insects, and is fireproof. It is also an economical choice for floating structures. Proper design and construction of

[3] Pier and Wharf Construction Part II: Structural Design - Pile Buck Magazine

concrete in pier and wharf construction is necessary. This includes prestressing precast concrete piles to resist the tensile forces encountered during driving and ensuring proper mix design.

Steel

Steel can be used in all types of marine structures when it is protected against corrosion, typically by marine coatings or wraps and cathodic protection systems. Steel is costly and requires maintenance; if other construction material is available, that other material may be a better choice. Further, the price of steel in the local and international marketplaces is highly variable making it infeasible to "tie down" associated costs.

Composites

Composite piles of concrete and steel can also be used to construct piers and wharves. This typically takes the form of either steel H-piles with a concrete casing or concrete-filled pipe piles.

Fiber Reinforced Plastics (FRP)

FRPs and ultra-high molecular weight plastics are durable in the marine environment. Some types are also highly resistant to abrasion. Because the uses of these plastics are relatively new in pier and wharf construction, caution should be exercised when selecting them for a project.

Permitting Requirements

The richness of the area's natural resources means that steps need to be taken to ensure that the identified natural-resource elements are protected, and that any proposed development is performed in a responsible manner that provides both short- and long-term protection. There are several governing regulations that would apply to the project, all of which would need to be considered as a project-development program unfolds.

Based on the size of the proposed structure, which would likely exceed the 2,000-sf pile supported structure threshold, consultation and the submittal of an Environmental Notification Form (ENF) through the Massachusetts Environmental Protection Act (MEPA) will be a significant step. Through the ENF process, the project will have consultations with numerous state, federal and local agencies, including MassDEP through the Waterways, Water Quality, and Wetlands programs, U.S. Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (EPA), MA DMF, National Oceanic and Atmospheric Administration (NOAA), Marine Fisheries, MA CZM, as well as other agencies, including the state historical and underwater archaeological boards, Town agencies, etc.

There are other natural resources including the Harbor itself as well as the eelgrass beds that exist within the Harbor, both of which fall under the protection of the Massachusetts Wetland Protection Act (WPA), and the Public Waterfront Act, commonly referred to as the Chapter 91 program. This program is the oldest of its kind in the nation, formally established in 1866, and is intended to protect and promote the public use of tidelands and other waterways. The program is tasked with ensuring that the development within current and historical tidelands is done while protecting and preserving public rights and workplace rights over the waterfront areas.

For permitting through the WPA (which is managed by MassDEP and the Swampscott Conservation Commission), the primary resource areas will be LUO (310 CMR 10.25), LCS (310 CMR 10.34), CB (310 CMR 10.27), and LSTCSF (310 CMR 10.04).

As part of the federal Clean Water Act (CWA), states are required to develop and update biennially a list of waters that are impaired, commonly referred to as the 303(d) list. According to the Massachusetts 303(d) list, a Total Maximum Daily Load (TMDL) has been established for Nahant Bay (MA93-24) for an impairment from fecal coliform and Enterococcus (TMDL No. 50121). The TMDL sets a target limit for fecal coliform entering the waterbodies from the entire watershed. Therefore, any redevelopment on the subject property would need to illustrate that a proposed project will not contribute potential additional fecal coliform to the waterbodies. This can be done by proper sewerage and control of waste and waste products in the area. The permit applications developed for this project would need to address this TMDL and show no deleterious effect from the proposed development plan.

The discussion above highlights several of the most notable regulations that would require addressing as part of the project permit package. As such to bring a project through design and construction, there will be a series of municipal, state and federal permitting activities to be undertaken. The full extent of the permit requirements will not be fully confirmed until the design phase of the project is completed, and the appropriate permit-application packages prepared and submitted. A list of the potential permits, their governing agency, regulations and why the permits may be required is presented in the table below:

Agency	**Permit**	**Regulations**	**Comments**
Local			
Swampscott Conservation Commission	Order of Conditions under the Local Wetland Bylaw	310 CMR 10.000	Required for any disturbance in tidal wetlands or within the buffer zone of the coastal resource
Swampscott Historical Commission		Swampscott General Bylaw – Article IX, Section 14	Advise and work with Town boards, committees, departments, and administration in all matters relating to historic preservation, including any proposed alteration, destruction, or relocation of historical assets
Swampscott Zoning Board of Appeals	Special permit	Swampscott Zoning By-law	Will be required if any of the proposed structure, signage, or features of the Pier do not comply with the Town of Swampscott zoning by-law
State			
MADEP	Order of Conditions-Wetland Protection Act	310 CMR 10.00	Required for any disturbance in tidal wetlands or within the buffer zone of the coastal resource
MADEP	401 Water Quality Certification	314 CMR 9.00	Should dredging or activities occur within the Harbor.
MADEP	Chapter 91 License	310 CMR 9.00	To allow a structure within Commonwealth Tidelands.

Agency	Permit	Regulations	Comments
MEPA	Environmental Notification Form, Draft Environmental Impact Report, Final Environmental Impact Report	301 CMR 11.00	Should any of the review thresholds under Section 11.03 be triggered, such as state-listed endangered species present, alterations requiring a variance under the Wetland Protection Act, a pile supported structure greater than 2,000 square feet in area
MEPA	Environmental Notification Form, Draft Environmental Impact Report, Final Environmental Impact Report	950 CMR 71.00	Work affecting historical properties and places as determined by the Massachusetts Historical Commission
Federal			
US Army Corps of Engineers	Clean Water Act 404 Permit	33 USC 1251, 33 CRF 322	For discharge of dredged or fill material into waters of the United States
US Army Corps of Engineers	Rivers and Harbors Act of 1899 Section 10	33 USC 401-413, 33 CFR 323	For work, including structures, seaward of the annual high-water line in navigable waters of the United States
Federal Emergency Management Agency	Floodplain determination	Executive Order No. 149	The National Flood Insurance Program is administered in Massachusetts by the Department of Conservation and Recreation. Requires review by applicable state agencies for projects within the Floodplain
US Fish and Wildlife	Incidental Take Permit	50 CFR 17.00	Any project that "takes" federally defined endangered or threatened species
US Environmental Protection Agency	Permit under the NPDES program	40 CFR 122	Construction activities disturbing greater than one acre of land will require coverage and authorization to discharge stormwater under the National Pollutant Discharge Elimination System administered through the EPA

Recommendations and Conclusions

As discussed above, the resource regulatory community raised concerns regarding the presence of eelgrass beds in Nahant Bay off of Fisherman's Beach. To address these concerns and with Town approval, MME pivoted the Project scope to confirming the locations and densities of the eelgrass beds in the overall Harbor area during the maximum growth period (i.e., a worst-case scenario). This survey was conducted in both the vicinity of the proposed Pier locations and the proposed location for a living breakwater nature-based solution.

The results of the Megalodon Eelgrass Survey supported the position that minimal or spotty eelgrass were located within proposed Pier locations and that with minor mitigation measures and best practices, the Pier could be reconfigured to better support the Town and local commercial fishing industry. With that data, the engineering study continued forward with the other data collected, including topographic and bathymetric survey information as well as geotechnical analysis.

This FS included the evaluation of eight project alternatives including the permit-required "do nothing" alternative, as well as seven potential alternatives which included various Pier locations, lengths and widths. The Alternatives Analysis includes the evaluation of several goal metrics: resiliency, community, economy and tourism impacts; and, project considerations including permitting difficulties, construction costs, O&M costs and impacts of existing Harbor uses. Based upon the alternative analyses, which included utilizing just-acquired data, HWAC interactions and the outcomes of the preliminary pre-application meeting, MME recommended that the following two project alternatives be included for discussions with the resource regulators during the next pre-application meeting currently scheduled to be conducted in 2023:

Project Concept Plan No. 5 (renamed as Concept Plan B for future endeavors): Installation of a new 441 foot long, 12-foot-wide Pier parallel to the existing pier. This alternative includes the installation of a new concrete vessel launching ramp and a floating wave attenuator docks to be installed at the end of the proposed Pier.

Project Concept Plan No. 7 (renamed as Concept Plan A for future endeavors): Installation of a new 695 foot long, 24-foot-wide Pier with a bump out and hexagonal area at its end. Its headlands would be located at the western edge of the Fisherman's beach parking area (or it could go just beyond that) and running north-south into slightly deeper water with a new landing area. This alternative includes the installation of a new concrete vessel launching ramp and floating wave attenuator docks to be installed at the end of the proposed Pier.

- Both preferred alternatives represent the most effective of the designs evaluated and are the most likely scenarios that best meet the project goals and considerations. Each of these designs would make this upgraded Pier accessible to every part of Swampscott, from the boaters, commercial fishermen, beach goers, visitors, and emergency vehicles. The redesigned and built Pier would also enhance the Harbor area in general, a key feature of the downtown area. The new Pier will become a focus of the community, allowing the Town to host different events, as well as add amenities such as temporary pop-up stands, and other features to benefit the community. Either one of the presented preferred designs would represent an enhanced and significantly improved Pier amenity for the Town, increasing boating activity, waterfront access, resident enjoyment, visitor use, and public safety.

Attachments

A - Existing Conditions Survey and Bathymetric Survey Plans

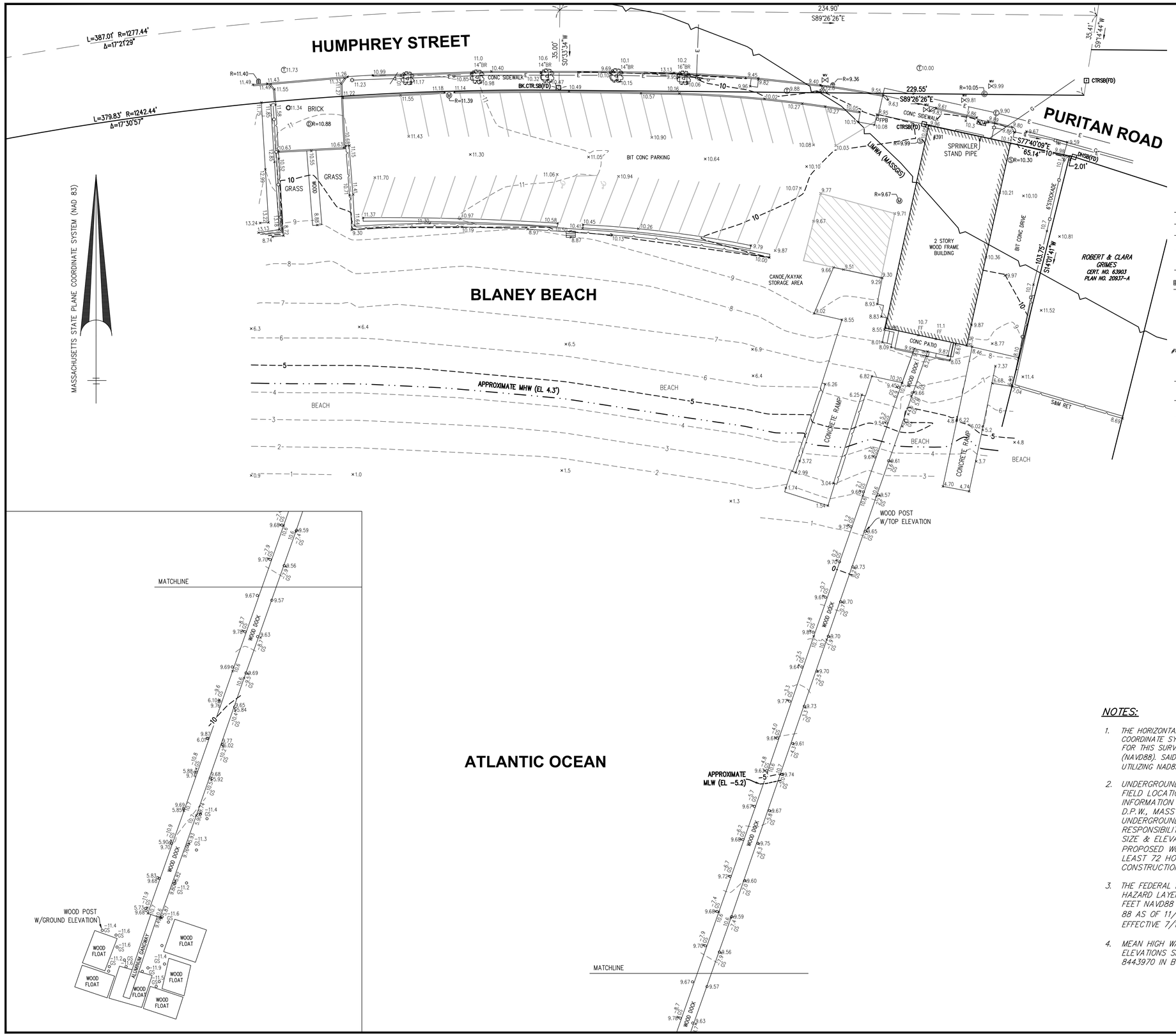
B- Conceptual Site Plans

C- Cross-sectional Details

D- Geotechnical Data

E- Eelgrass Assessment Report and Figures

Attachment A - Existing Conditions Survey and Bathymetric Survey Plans



ASSESSORS:

MAP 19, LOT 278A

REFERENCES:

NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:

TOWN OF SWAMPSCOTT

ZONING: A4

LEGEND

102	SURFACE CONTOUR
	EDGE OF PAVEMENT
	WOOD FENCE
86.75 / 86.25	CURB WITH TOP AND BOTTOM CURB ELEVATION
S 8"CI S	SEWERLINE & MANHOLE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION
D 12"RCP D	DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
WV 6"CI W	WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
GV 10"DI G	GAS MAIN WITH SIZE & GATE VALVE
#181 OHW	EXISTING UTILITY POLE WITH DESIGNATION OVERHEAD WIRES AND GUY POLE
E	ELECTRIC MANHOLE & UNDERGROUND ELECTRIC LINES
T	TELEPHONE MANHOLE & UNDERGROUND TELEPHONE LINES
98.8 / 93.2	RETAINING WALL WITH TOP AND BOTTOM ELEVATIONS
× 100.7	SPOT ELEVATION
93.7 / 12"M	PROMINENT DECIDUOUS TREE WITH ELEVATION, SIZE AND SPECIES
	LIGHT POLE
SMH S	SEWER MANHOLE
DMH D	DRAIN MANHOLE
CB	CATCH BASIN
	D GRATE CATCHBASIN
	BOLLARD
	SIGN
DHSB	DRILL HOLE IN STONE BOUND
CTR. BK.	CENTER BACK
VGC	VERTICAL GRANITE CURB
BIT. CONC.	BITUMINOUS CONCRETE
GS	ELEVATION AT GROUND
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE
CPP	CORRUGATED PLASTIC PIPE
LIMWA	LIMIT OF MODERATE WAVE ACTION FROM MASSGIS DATA
MHW	MEAN HIGH WATER
MLW	MEAN LOW WATER

NOTES:

1. THE HORIZONTAL DATUM FOR THIS SURVEY IS THE MASSACHUSETTS COORDINATE SYSTEM, NAD 1983, MAINLAND ZONE. THE VERTICAL DATUM FOR THIS SURVEY IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). SAID DATUMS WERE ESTABLISHED VIA GPS OBSERVATIONS UTILIZING NAD83 (NA2011) EPOCH 2010.00 (MYCS2) AND GEOID 18.
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3. THE FEDERAL EMERGENCY MANAGEMENT AGENCY NATIONAL FLOOD HAZARD LAYER VIEWER DESIGNATES AN AE ZONE ELEVATION OF 15 FEET NAVD88 AS WELL A VE ZONE ELEVATION OF 22 FEET NAVED 88 AS OF 11/10/2021. (REF: MAP NUMBER 25009C0418G, EFFECTIVE 7/16/2014).
4. MEAN HIGH WATER (MHW) AND MEAN LOW WATER (MLW) ELEVATIONS SHOWN HEREON ARE FROM NOAA TIDE STATION 8443970 IN BOSTON, MA.

SCALE: 1" = 20'

0 20 40 80

#391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

McALLISTER MARINE ENGINEERING, LLC

16 Hoxie Street
Charlestown, Rhode Island 02813

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Wetland Scientists

185 CENTRE STREET, DANVERS, MA 01923
VOICE (978) 777-3050, FAX (978) 774-7816
WWW.HANCOCKASSOCIATES.COM

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 11/11/2021	DRAWN BY: RDF
SCALE: 1" = 20'	CHECK BY: WCJ

EXISTING CONDITIONS PLAN OF LAND IN SWAMPSCOTT, MA

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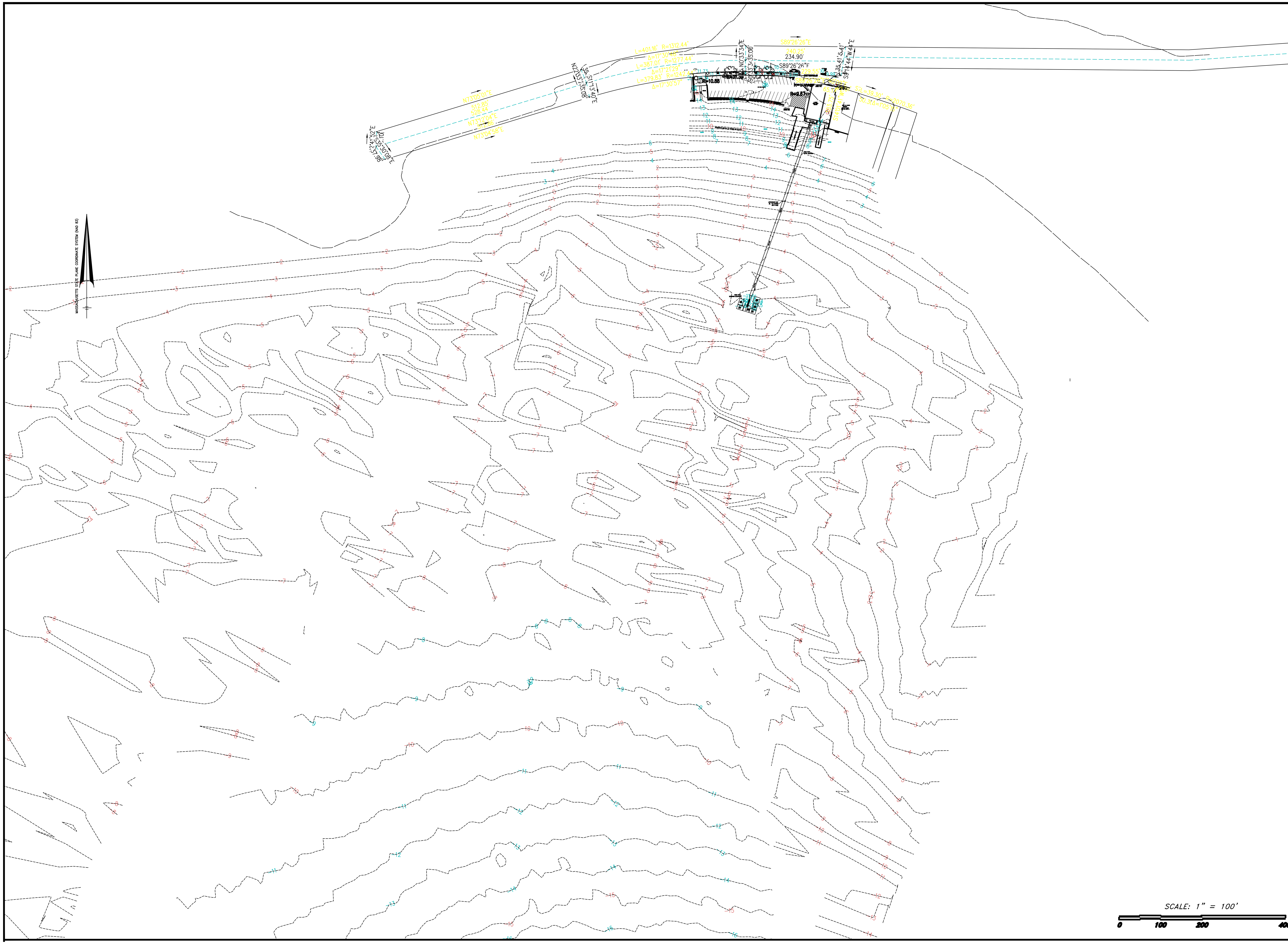
LAYOUT: EC	
SHEET: 1 OF 1	
PROJECT NO.:	25476



Swampscott Town Pier Fisherman's Beach #391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

TOWN OF SWAMPSCOTT, MA

22 Monument Avenue
Swampscott, MA 01907

MCALLISTER MARINE ENGINEERING

16 Hoxie Street
Charlestown, Rhode Island 02813

HANCOCK ASSOCIATES
Civil Engineers
Land Surveyors
Wetland Scientists

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WWW.HANCOCKASSOCIATES.COM

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 11/11/2021	DRAWN BY: RDF
SCALE: 1" = 100'	CHECK BY: JBM

EXISTING CONDITIONS PLAN OF LAND IN SWAMPSCOTT, MA

PLOT DATE: Nov 16, 2022 4:53 am

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev3

LAYOUT: EC (2)

SHEET: 1 OF 1

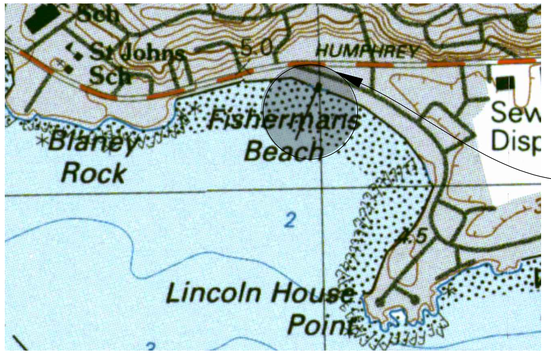
PROJECT NO.: 25476

SCALE: 1" = 100'

0 100 200 400

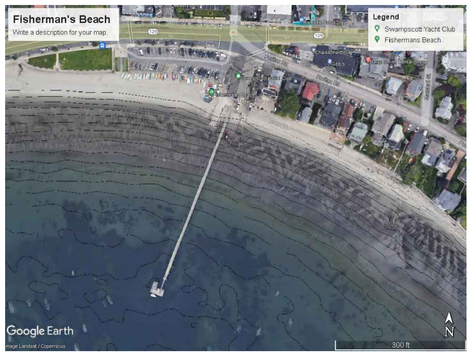
Attachment B- Conceptual Site Plans

FISHERMAN'S BEACH
ALBERT J. WILLIAMS PIER
REVEDELOPMENT FEASIBILITY PROJECT
HUMPHREY STREET
SWAMPSCOTT, MASSACHUSETTS



LOCUS

SITE LOCUS
N.T.S.



PROJECT PROPONENT:
TOWN OF SWAMPSCOTT
22 MONUMENT AVENUE
SWAMPSCOTT, MA 01907

PREPARED BY:
MCALLISTER MARINE ENGINEERING, LLC
16 HOXIE AVENUE
CHARLESTOWN, RI 02813
WWW.MCALLISTER-ENG.COM

DRAFT
NOT FOR PERMITTING
NOT FOR CONSTRUCTION

Swampscott Town Pier
Fisherman's Beach
#391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:
TOWN OF SWAMPSCOTT, MA

22 Monument Avenue
Swampscott, MA 01907

MCALLISTER MARINE ENGINEERING

16 Hoxie Street
Charlestown, Rhode Island 02813

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/22 DRAWN BY: RDF
SCALE: AS SHOWN CHECK BY: JBM

COVER SHEET

PLOT DATE: Dec 29, 2022 4:02 pm
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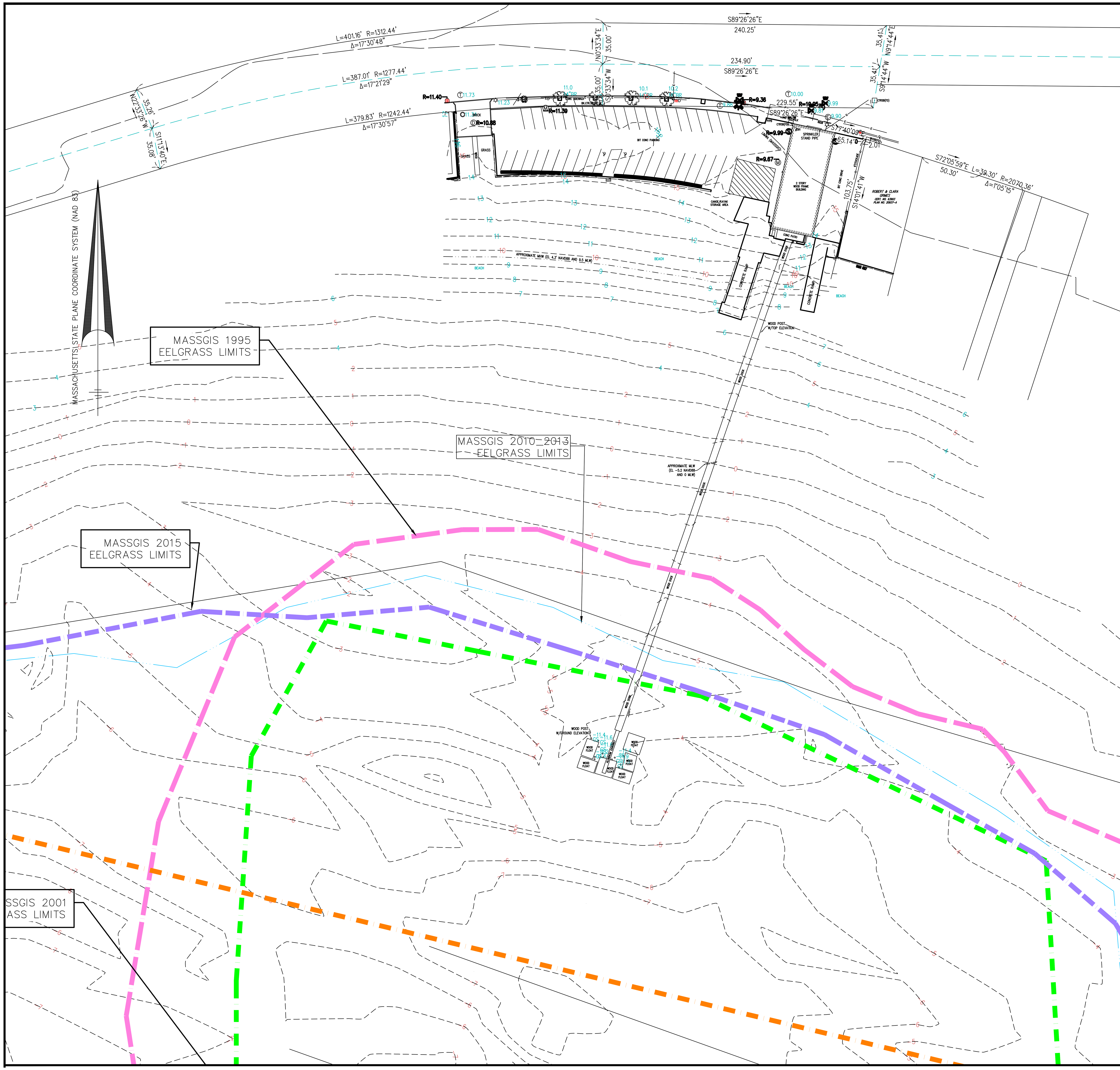
SHEET: 1 OF 9
PROJECT NO.: 25476



ASSESSORS:
MAP 19, LOT 278A

REFERENCES:
NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:
TOWN OF SWAMPSCOTT

ZONING:
A4

LEGEND

- SURFACE CONTOUR
- EDGE OF PAVEMENT
- WOOD FENCE
- CURB WITH TOP AND BOTTOM CURB ELEVATION
- SEWERLINE & MANHOLE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION
- DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
- WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
- GAS MAIN WITH SIZE & GATE VALVE
- EXISTING UTILITY POLE WITH DESIGNATION OVERHEAD WIRES AND GUY POLE
- ELECTRIC MANHOLE & UNDERGROUND ELECTRIC LINES
- TELEPHONE MANHOLE & UNDERGROUND TELEPHONE LINES
- RETAINING WALL WITH TOP AND BOTTOM ELEVATIONS
- × 100.7 SPOT ELEVATION
- PROMINENT DECIDUOUS TREE WITH ELEVATION, SIZE AND SPECIES
- LIGHT POLE
- SMH SEWER MANHOLE
- DMH DRAIN MANHOLE
- CB CATCH BASIN
- D GRATE CATCHBASIN
- BOLLARD
- SIGN
- DHSB DRILL HOLE IN STONE BOUND
- CTR. BK. CENTER BACK
- VGC VERTICAL GRANITE CURB
- BIT. CONC. BITUMINOUS CONCRETE
- GS ELEVATION AT GROUND
- RCP REINFORCED CONCRETE PIPE
- PVC POLYVINYL CHLORIDE
- CPP CORRUGATED PLASTIC PIPE
- LIMWA LIMIT OF MODERATE WAVE ACTION FROM MASSGIS DATA
- MHW MEAN HIGH WATER
- MLW MEAN LOW WATER
- CONCEPTUAL FLOATING WAVE ATTENUATOR
- CONCEPTUAL TOWN PIER CONFIGURATION
- CONCEPTUAL BOAT RAMP LAYOUT
- MAPPED EELGRASS AREA 2010–2013
- MAPPED EELGRASS AREA 1995
- MAPPED EELGRASS AREA 2001
- MAPPED EELGRASS AREA 2015
- MAPPED EELGRASS AREA 2022 (MEGALODON)

NOTES:

1. THE HORIZONTAL DATUM FOR THIS SURVEY IS THE MASSACHUSETTS COORDINATE SYSTEM, NAD 1983, MAINLAND ZONE. THE VERTICAL DATUM FOR THIS PLAN HAS BEEN CONVERTED TO MEAN LOW WATER FROM THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). THE SURVEY DATUMS WERE ESTABLISHED VIA GPS OBSERVATIONS UTILIZING NAD83 (NA2011) EPOCH 2010.00 (MYCS2) AND GEOID 18. TO CONVERT FROM MLW, THE DATUM SHOWN ON THESE PLANS, TO NAVD88, SUBTRACT 5.2 FT FROM THE ELEVATION IN MLW.
2. UNDERGROUND UTILITIES SHOWN HEREON ARE COMPILED FROM FIELD LOCATIONS OF STRUCTURES AND FROM AVAILABLE RECORD INFORMATION ON FILE AT THE TOWN ENGINEERING OFFICES, TOWN D.P.W., MASS HIGHWAY DEPT. AND UTILITY COMPANIES. OTHER UNDERGROUND UTILITIES MAY EXIST. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION, SIZE & ELEVATION OF ALL UTILITIES WITHIN THE AREA OF PROPOSED WORK AND TO CONTACT "DIG-SAFE" AT 811 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION, DEMOLITION OR CONSTRUCTION.
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4. MEAN HIGH WATER (MHW) AND MEAN LOW WATER (MLW) ELEVATIONS SHOWN HEREON ARE FROM NOAA TIDE STATION 8443970 IN BOSTON, MA.
5. EXISTING CONDITIONS SHOWN FROM LAND SURVEY PERFORMED BY HANCOCK ASSOCIATES IN NOVEMBER 2021 AND BATHYMETRIC SURVEY PERFORMED BY MCALLISTER MARINE ENGINEERING IN JULY 2022.

SCALE: 1" = 40'

0 40 80 160

Swampscott Town Pier Fisherman's Beach #391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

TOWN OF SWAMPSCOTT, MA

22 Monument Avenue
Swampscott, MA 01907

MCALLISTER MARINE ENGINEERING
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NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 40' CHECK BY: WCJ

EXISTING CONDITIONS PLAN OF LAND IN SWAMPSCOTT, MA

PLOT DATE: Dec 29, 2022 4:04 pm

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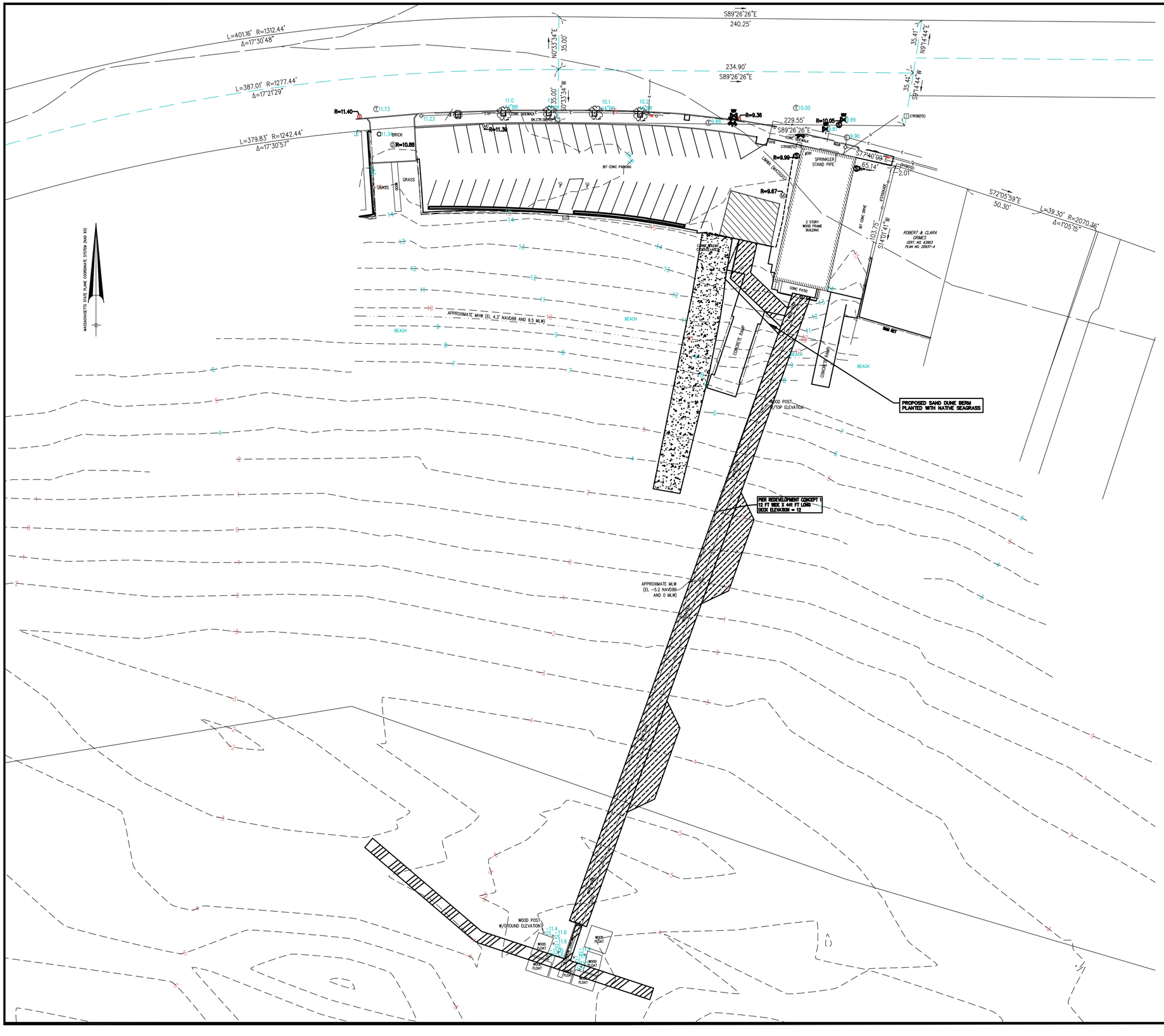
LAYOUT: EC
SHEET: 2 OF 9
PROJECT NO.: 25476



ASSESSORS:

MAP 19, LOT 278A

REFERENCES:

NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:

TOWN OF SWAMPSCOTT

ZONING:

A4

LEGEND

- SURFACE CONTOUR
- EDGE OF PAVEMENT
- WOOD FENCE
- CURB WITH TOP AND BOTTOM CURB ELEVATION
- SEWERLINE & MANHOLE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION
- DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
- WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
- GAS MAIN WITH SIZE & GATE VALVE
- EXISTING UTILITY POLE WITH DESIGNATION OVERHEAD WIRES AND GUY POLE
- ELECTRIC MANHOLE & UNDERGROUND ELECTRIC LINES
- TELEPHONE MANHOLE & UNDERGROUND TELEPHONE LINES
- RETAINING WALL WITH TOP AND BOTTOM ELEVATIONS
- SPOT ELEVATION
- PROMINENT DECIDUOUS TREE WITH ELEVATION, SIZE AND SPECIES
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- DMH — DRAIN MANHOLE
- CB — CATCH BASIN
- D GRATE CATCHBASIN
- BOLLARD
- SIGN
- DHSB — DRILL HOLE IN STONE BOUND
- CTR. BK. — CENTER BACK
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- RCP — REINFORCED CONCRETE PIPE
- PVC — POLYVINYL CHLORIDE
- CPP — CORRUGATED PLASTIC PIPE
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- MHW — MEAN HIGH WATER
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- CONCEPTUAL FLOATING WAVE ATTENUATOR
- CONCEPTUAL TOWN PIER CONFIGURATION
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- MAPPED EELGRASS AREA 2010–2013
- MAPPED EELGRASS AREA 1995
- MAPPED EELGRASS AREA 2001
- MAPPED EELGRASS AREA 2015
- MAPPED EELGRASS AREA 2022 (MEGALODON)

SCALE: 1" = 30'

0 30 60 120

Swampscott Town Pier Fisherman's Beach #391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

TOWN OF SWAMPSCOTT, MA

22 Monument Avenue
Swampscott, MA 01907

MCALLISTER MARINE ENGINEERING

16 Hoxie Street
Charlestown, Rhode Island 02813

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 30' CHECK BY: WCJ

PROPOSED PIER REDEVELOPMENT CONCEPT PLAN 1 DRAFT

PLOT DATE: Dec 29, 2022 4:05 pm
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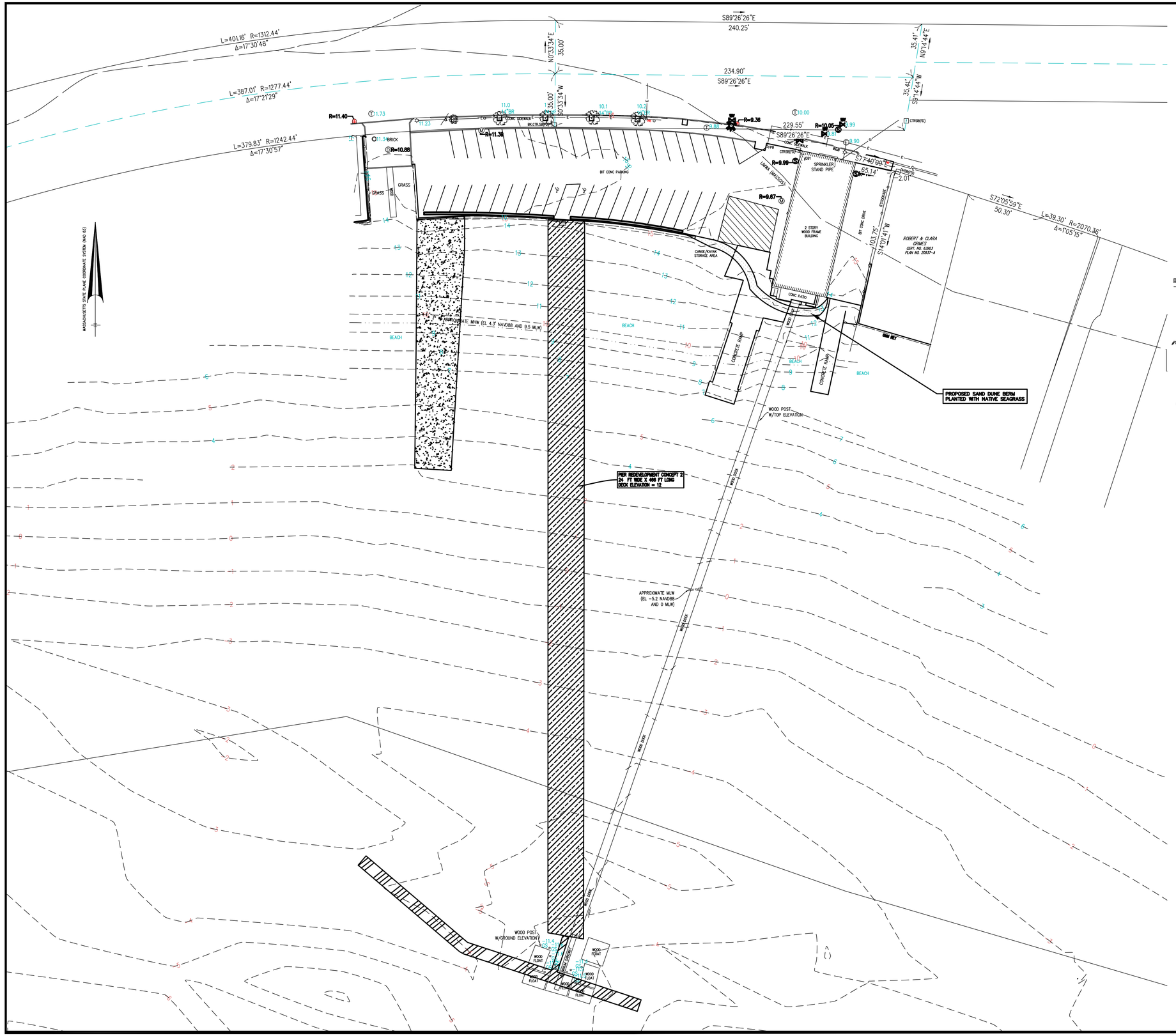
LAYOUT: PC-1
SHEET: 3 OF 9
PROJECT NO.: 25476



ASSESSORS:

MAP 19, LOT 27BA

REFERENCES:

NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:

TOWN OF SWAMPSCOTT

ZONING: A4

LEGEND

102	SURFACE CONTOUR
	EDGE OF PAVEMENT
	WOOD FENCE
86.75 / 86.25	CURB WITH TOP AND BOTTOM CURB ELEVATION
S 8"CI S	SEWERLINE & MANHOLE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION
D 12"RCP D	DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
W 6"CI	WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
G 10"DI	GAS MAIN WITH SIZE & GATE VALVE
OHW	EXISTING UTILITY POLE WITH DESIGNATION OVERHEAD WIRES AND GUY POLE
E	ELECTRIC MANHOLE & UNDERGROUND ELECTRIC LINES
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	MAPPED EELGRASS AREA 2010–2013
	MAPPED EELGRASS AREA 1995
	MAPPED EELGRASS AREA 2001
	MAPPED EELGRASS AREA 2015
	MAPPED EELGRASS AREA 2022 (MEGALODON)

SCALE: 1" = 30'

0 30 60 120

Swampscott Town Pier Fisherman's Beach #391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

TOWN OF SWAMPSCOTT, MA

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Swampscott, MA 01907

MCALLISTER MARINE ENGINEERING

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NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 30' CHECK BY: JBM

PROPOSED PIER REDEVELOPMENT CONCEPT PLAN 2 DRAFT

PLOT DATE: Dec 29, 2022 4:06 pm
PATH: C:\Users\johnm\OneDrive\Documents\JBM\MME\Projects\Swampscott\Plans\

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev5.dwg
LAYOUT: PC-2
SHEET: 4 OF 9
PROJECT NO.: 25476

ASSESSORS:

MAP 19, LOT 27BA

REFERENCES:

NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:

TOWN OF SWAMPSCOTT

ZONING: A4

LEGEND

102	SURFACE CONTOUR
	EDGE OF PAVEMENT
	WOOD FENCE
86.75 / 86.25	CURB WITH TOP AND BOTTOM CURB ELEVATION
S — 8"CI — S	SEWERLINE & MANHOLE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION
D — 12"RCP — D	DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
W — 6"CI	WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
G — 10"DI	GAS MAIN WITH SIZE & GATE VALVE
OHW	EXISTING UTILITY POLE WITH DESIGNATION OVERHEAD WIRES AND GUY POLE
E	ELECTRIC MANHOLE & UNDERGROUND ELECTRIC LINES
T	TELEPHONE MANHOLE & UNDERGROUND TELEPHONE LINES
98.8 / 93.2	RETAINING WALL WITH TOP AND BOTTOM ELEVATIONS
× 100.7	SPOT ELEVATION
93.7 12"M	PROMINENT DECIDUOUS TREE WITH ELEVATION, SIZE AND SPECIES
	LIGHT POLE
SMH	SEWER MANHOLE
DMH	DRAIN MANHOLE
CB	CATCH BASIN
	D GRATE CATCHBASIN
	BOLLARD
	SIGN
DHSB	DRILL HOLE IN STONE BOUND
CTR. BK.	CENTER BACK
VGC	VERTICAL GRANITE CURB
BIT. CONC.	BITUMINOUS CONCRETE
GS	ELEVATION AT GROUND
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE
CPP	CORRUGATED PLASTIC PIPE
LIMWA	LIMIT OF MODERATE WAVE ACTION FROM MASSGIS DATA
MHW	MEAN HIGH WATER
MLW	MEAN LOW WATER
	CONCEPTUAL FLOATING WAVE ATTENUATOR
	CONCEPTUAL TOWN PIER CONFIGURATION
	CONCEPTUAL BOAT RAMP LAYOUT
	MAPPED EELGRASS AREA 2010-2013
	MAPPED EELGRASS AREA 1995
	MAPPED EELGRASS AREA 2001
	MAPPED EELGRASS AREA 2015
	MAPPED EELGRASS AREA 2022 (MEGALODON)

SCALE: 1" = 30'

0 30 60 120

Swampscott Town Pier Fisherman's Beach #391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

TOWN OF SWAMPSCOTT, MA

22 Monument Avenue
Swampscott, MA 01907

MCALLISTER MARINE ENGINEERING

16 Hoxie Street
Charlestown, Rhode Island 02813

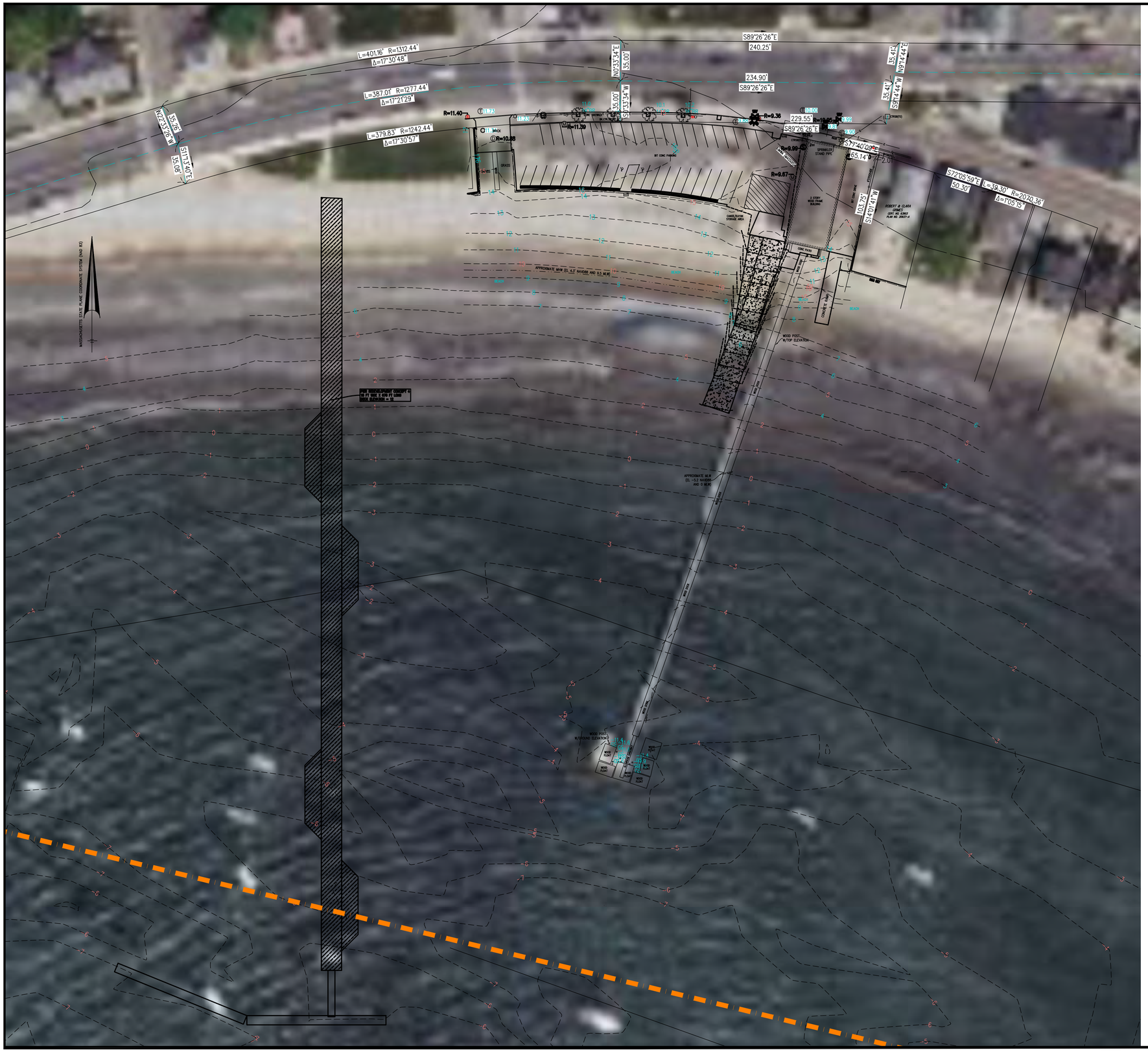
NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 30' CHECK BY: JBM

PROPOSED PIER REDEVELOPMENT CONCEPT PLAN 3 DRAFT

PLOT DATE: Dec 29, 2022 4:07 pm
PATH: C:\Users\jbmm\OneDrive\Documents\JBM\MME\Projects\Swampscott\Plans\

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev5.dwg
LAYOUT: PC-3
SHEET: 5 OF 9
PROJECT NO.: 25476



ASSESSORS:

MAP 19, LOT 27BA

REFERENCES:

NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:

TOWN OF SWAMPSCOTT

ZONING: A4

LEGEND

- 102 — SURFACE CONTOUR
- EDGE OF PAVEMENT
- WOOD FENCE
- 86.75 / 86.25 — CURB WITH TOP AND BOTTOM CURB ELEVATION
- S — 8"CI — S — SEWERLINE & MANHOLE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION
- D — 12"RCP — D — DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
- W — 6"CI — WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
- GV — G — 10"DI — GAS MAIN WITH SIZE & GATE VALVE
- D — OHW — EXISTING UTILITY POLE WITH DESIGNATION OVERHEAD WIRES AND GUY POLE
- E — ELECTRIC MANHOLE & UNDERGROUND ELECTRIC LINES
- T — TELEPHONE MANHOLE & UNDERGROUND TELEPHONE LINES
- #181 — 98.8 / 93.2 — RETAINING WALL WITH TOP AND BOTTOM ELEVATIONS
- × 100.7 — SPOT ELEVATION
- 93.7 12"M — PROMINENT DECIDUOUS TREE WITH ELEVATION, SIZE AND SPECIES
- LIGHT POLE
- SMH — SEWER MANHOLE
- DMH — DRAIN MANHOLE
- CB — CATCH BASIN
- D GRATE CATCHBASIN
- BOLLARD
- SIGN
- DHSB — DRILL HOLE IN STONE BOUND
- CTR. BK. — CENTER BACK
- VGC — VERTICAL GRANITE CURB
- BIT. CONC. — BITUMINOUS CONCRETE
- GS — ELEVATION AT GROUND
- RCP — REINFORCED CONCRETE PIPE
- PVC — POLYVINYL CHLORIDE
- CPP — CORRUGATED PLASTIC PIPE
- LIMWA — LIMIT OF MODERATE WAVE ACTION FROM MASSDOS DATA
- MHW — MEAN HIGH WATER
- MLW — MEAN LOW WATER
- CONCEPTUAL FLOATING WAVE ATTENUATOR
- CONCEPTUAL TOWN PIER CONFIGURATION
- CONCEPTUAL BOAT RAMP LAYOUT
- MAPPED EELGRASS AREA 2010-2013
- MAPPED EELGRASS AREA 1995
- MAPPED EELGRASS AREA 2001
- MAPPED EELGRASS AREA 2015
- MAPPED EELGRASS AREA 2022 (MEGALODON)

SCALE: 1" = 40'

0 40 80 100

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PREPARED FOR:

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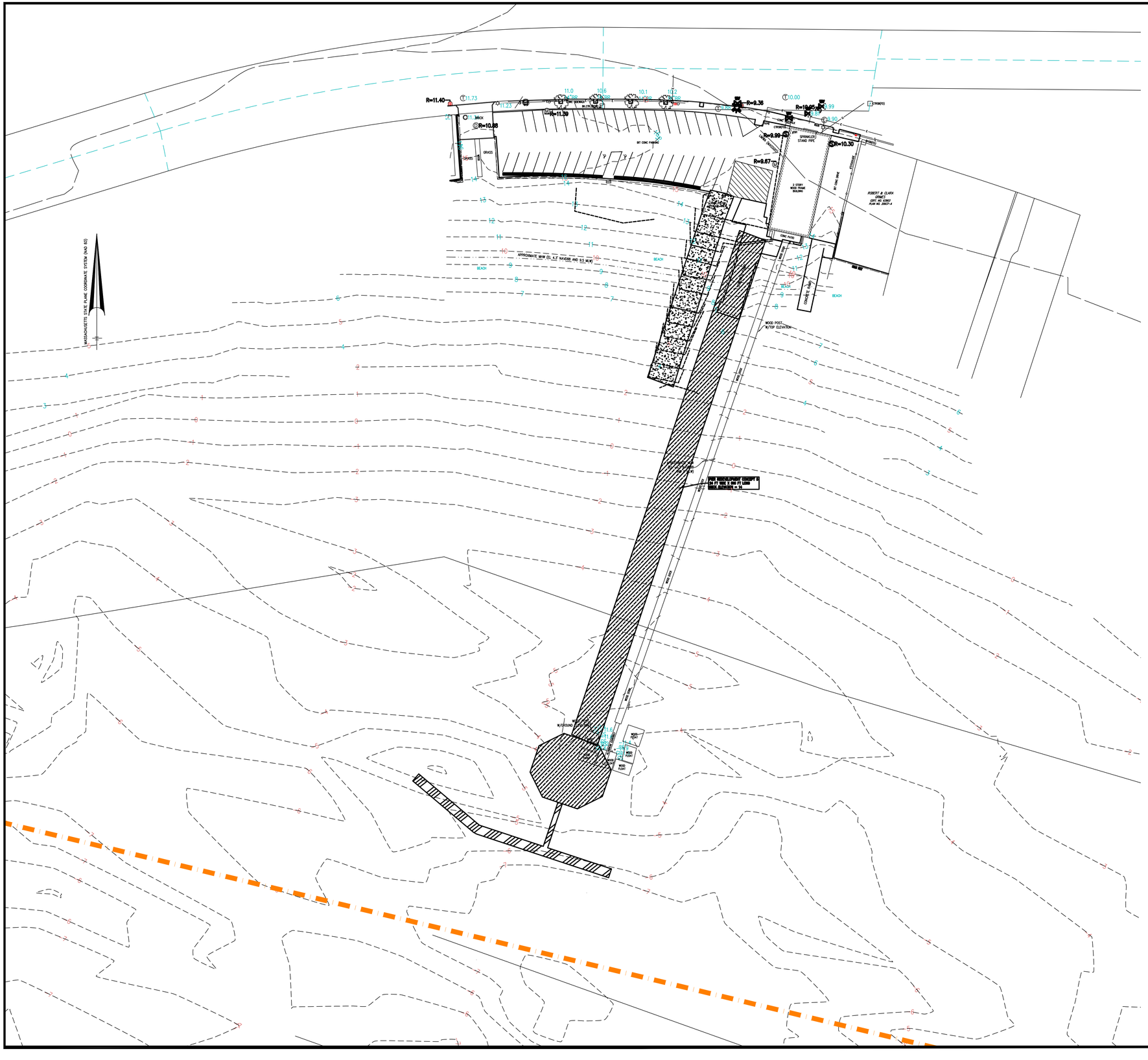
NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 40' CHECK BY: JBM

PROPOSED PIER REDEVELOPMENT CONCEPT PLAN 4 DRAFT

PLOT DATE: Dec 29, 2022 4:09 pm
PATH: C:\Users\jbmm\OneDrive\Documents\JBM\MME\Projects\Swampscott\Plans\

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev5.dwg
LAYOUT: PC-4
SHEET: 6 OF 9
PROJECT NO.: 25476



ASSESSORS:

MAP 19, LOT 27BA

REFERENCES:

NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:

TOWN OF SWAMPSCOTT

ZONING: A4

LEGEND

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	WOOD FENCE
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	MAPPED EELGRASS AREA 2015
	MAPPED EELGRASS AREA 2022 (MEGALODON)

SCALE: 1" = 40'

0 40 80 160

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MCALLISTER MARINE ENGINEERING

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Charlestown, Rhode Island 02813

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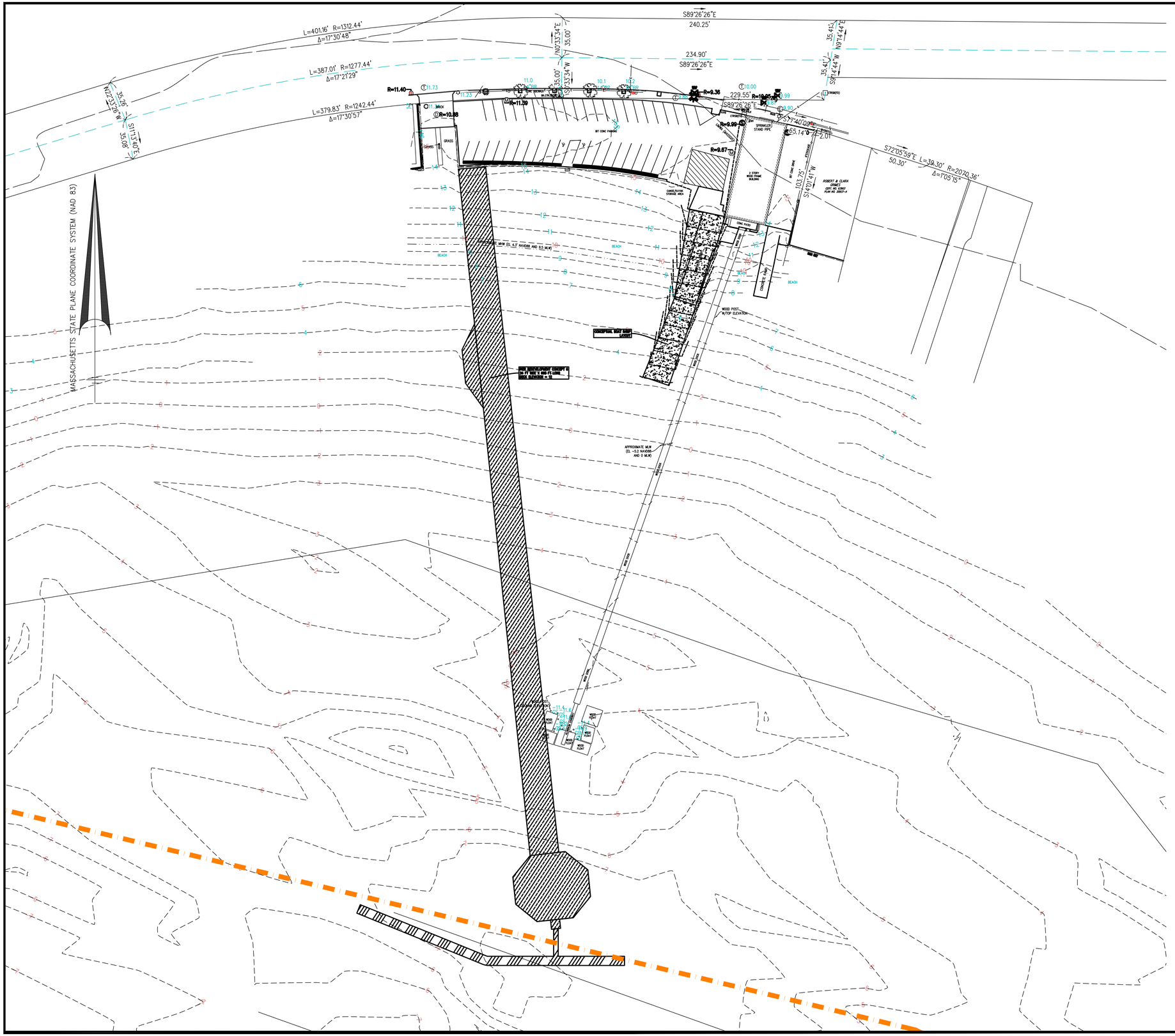
DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 40' CHECK BY: JBM

PROPOSED PIER REDEVELOPMENT CONCEPT PLAN 5 (AKA B) DRAFT

PLOT DATE: Dec 29, 2022 4:10 pm
PATH: C:\Users\Johnm\OneDrive\Documents\JBM\MME\Projects\Swampscott\Plans\

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev5.dwg
LAYOUT: PC-5
SHEET: 7 OF 9
PROJECT NO.: 25476



ASSESSORS:

MAP 19, LOT 27BA

REFERENCES:

NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:

TOWN OF SWAMPSCOTT

ZONING:

A4

LEGEND

102	SURFACE CONTOUR
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	WOOD FENCE
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	MAPPED EELGRASS AREA 2022 (MEGALODON)

Swampscott Town Pier
Fisherman's Beach
#391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

TOWN OF SWAMPSCOTT, MA

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MCALLISTER MARINE ENGINEERING

16 Hoxie Street
Charlestown, Rhode Island 02813

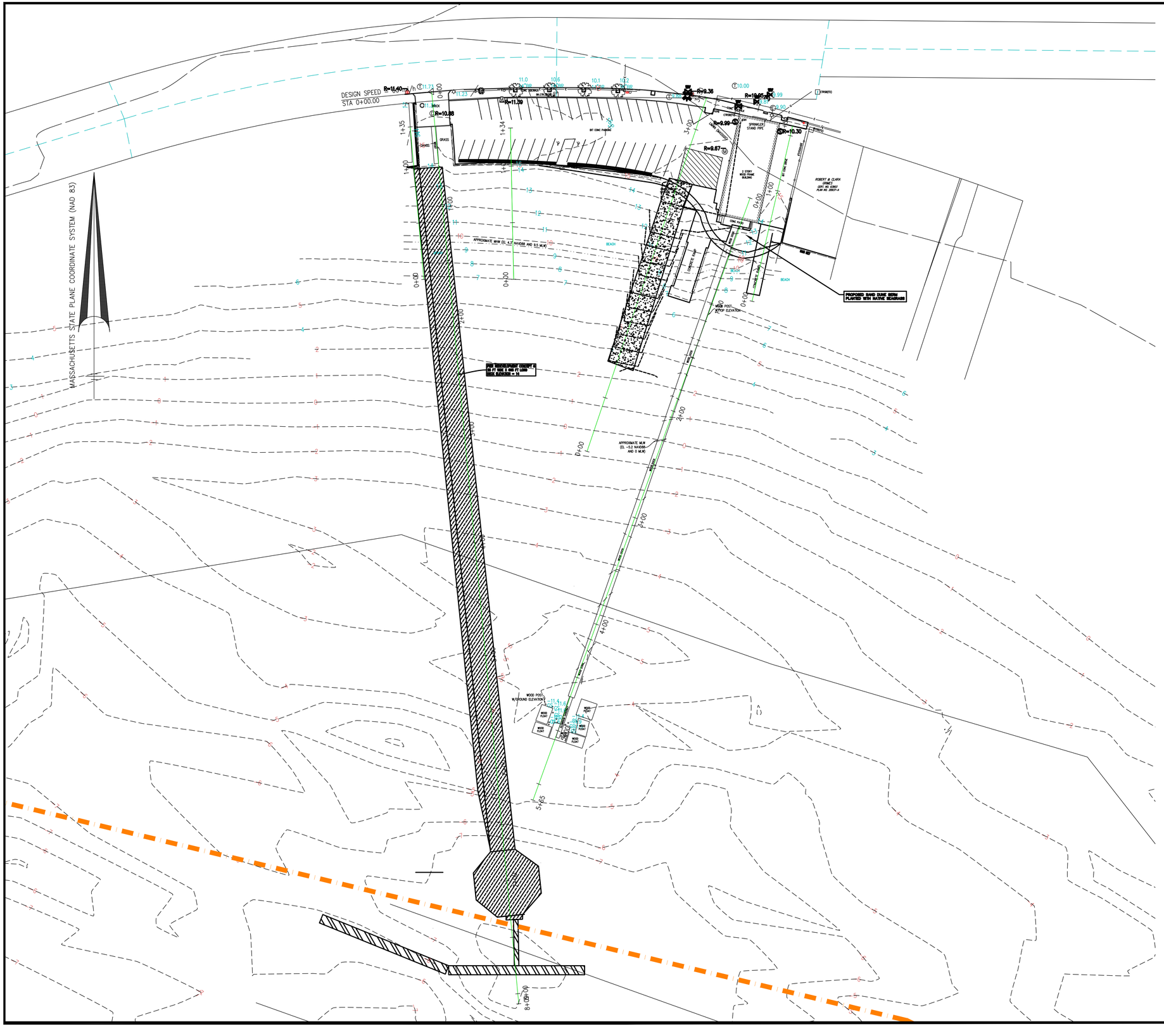
NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 40' CHECK BY: JBM

PROPOSED PIER REDEVELOPMENT CONCEPT PLAN 6 DRAFT

PLOT DATE: Dec 29, 2022 4:11 pm
PATH: C:\Users\jbmm\OneDrive\Documents\JBM\MME\Projects\Swampscott\Plans\

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev5.dwg
LAYOUT: PC-6
SHEET: 8 OF 9
PROJECT NO.: 25476



ASSESSORS:

MAP 19, LOT 278A

REFERENCES:

NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:

TOWN OF SWAMPSCOTT

ZONING: A4

LEGEND

102	SURFACE CONTOUR
	EDGE OF PAVEMENT
	WOOD FENCE
86.75 / 86.25	CURB WITH TOP AND BOTTOM CURB ELEVATION
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12"RCP D	DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
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	MAPPED EELGRASS AREA 1995
	MAPPED EELGRASS AREA 2001
	MAPPED EELGRASS AREA 2015
	MAPPED EELGRASS AREA 2022 (MEGALODON)

SCALE: 1" = 40'

0 40 80 160

Swampscott Town Pier Fisherman's Beach #391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

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MCALLISTER MARINE ENGINEERING

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Charlestown, Rhode Island 02813

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

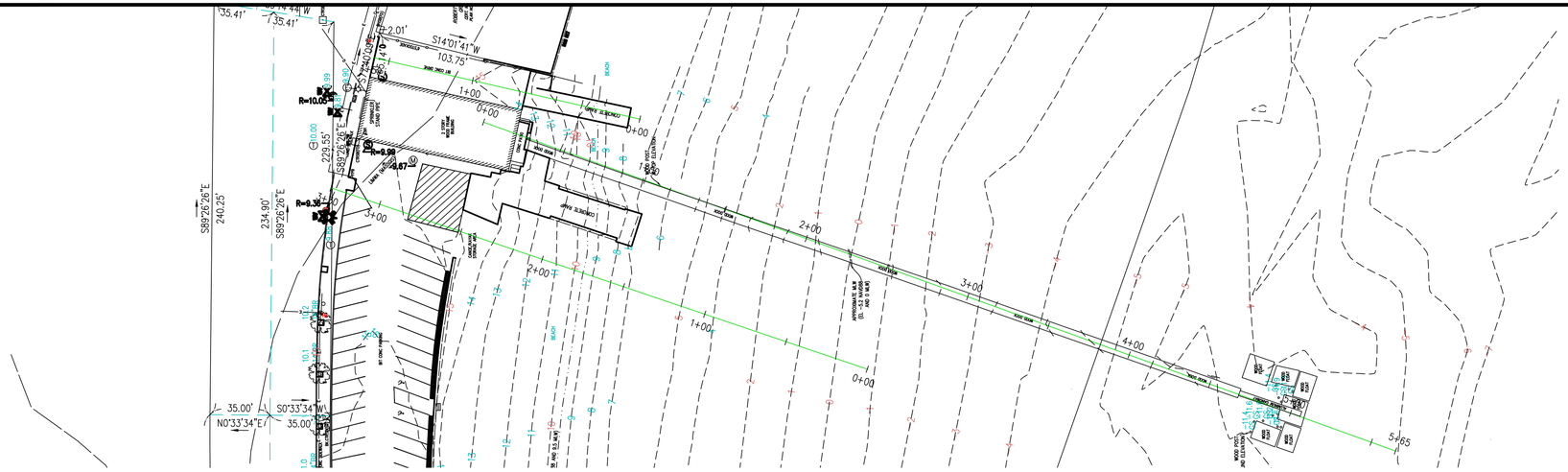
DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 40' CHECK BY: JBM

PROPOSED PIER REDEVELOPMENT CONCEPT PLAN 7 (AKA A) DRAFT

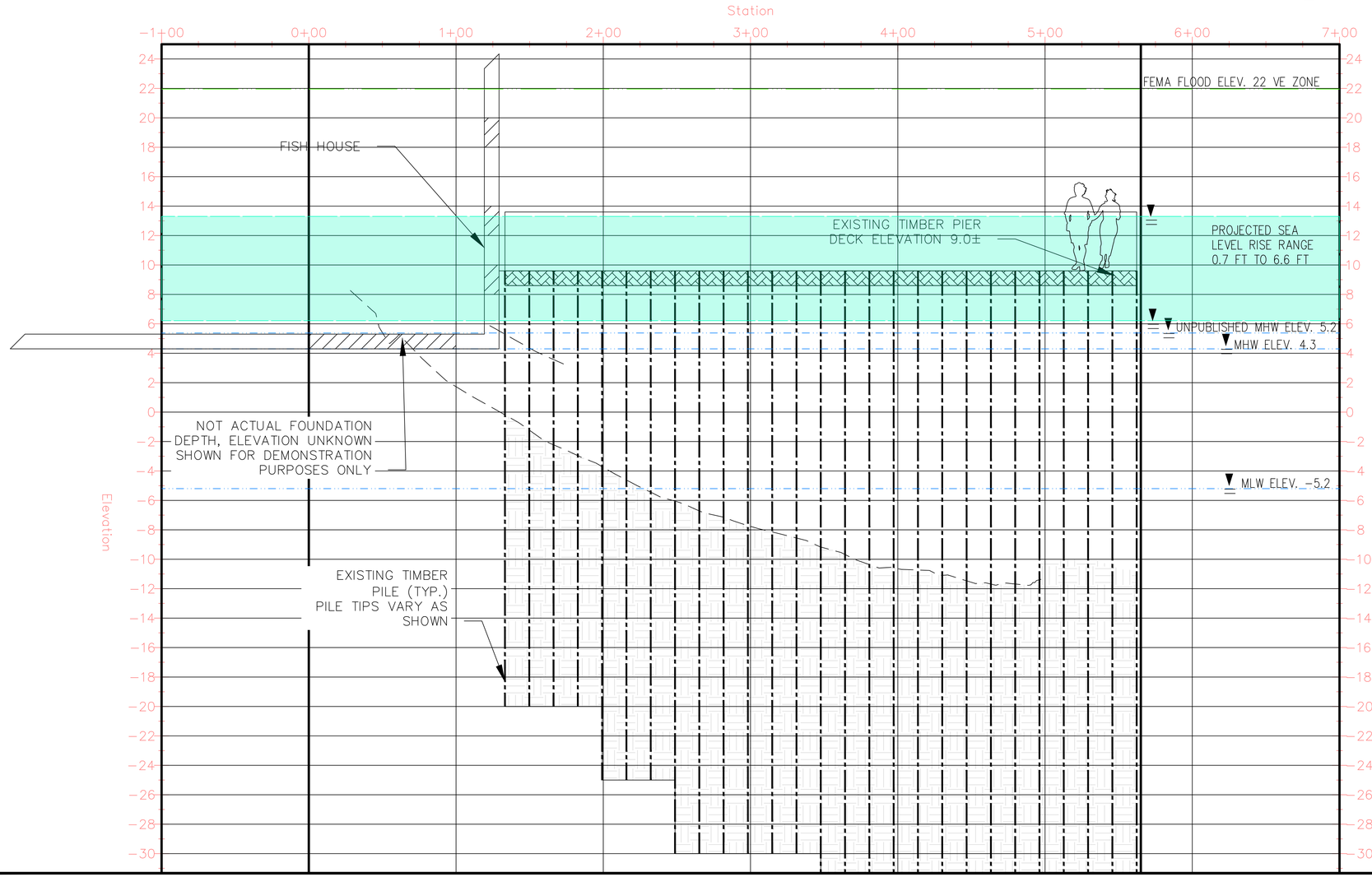
PLOT DATE: Dec 29, 2022 4:13 pm
PATH: C:\Users\jbmm\OneDrive\Documents\JBM\MME\Projects\Swampscott\Plans\

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev5.dwg
LAYOUT: PC-7
SHEET: 9 OF 9
PROJECT NO.: 25476

Attachment C- Cross-sectional Details



Alignment – Existing PROFILE



SCALE: 1" = 40'

0 40 80 100

Swampscott Town Pier
Fisherman's Beach #391
HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

TOWN OF SWAMPSCOTT, MA

22 Monument Avenue
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MCALLISTER MARINE ENGINEERING

16 Hoxie Street
Charlestown, Rhode Island 02813

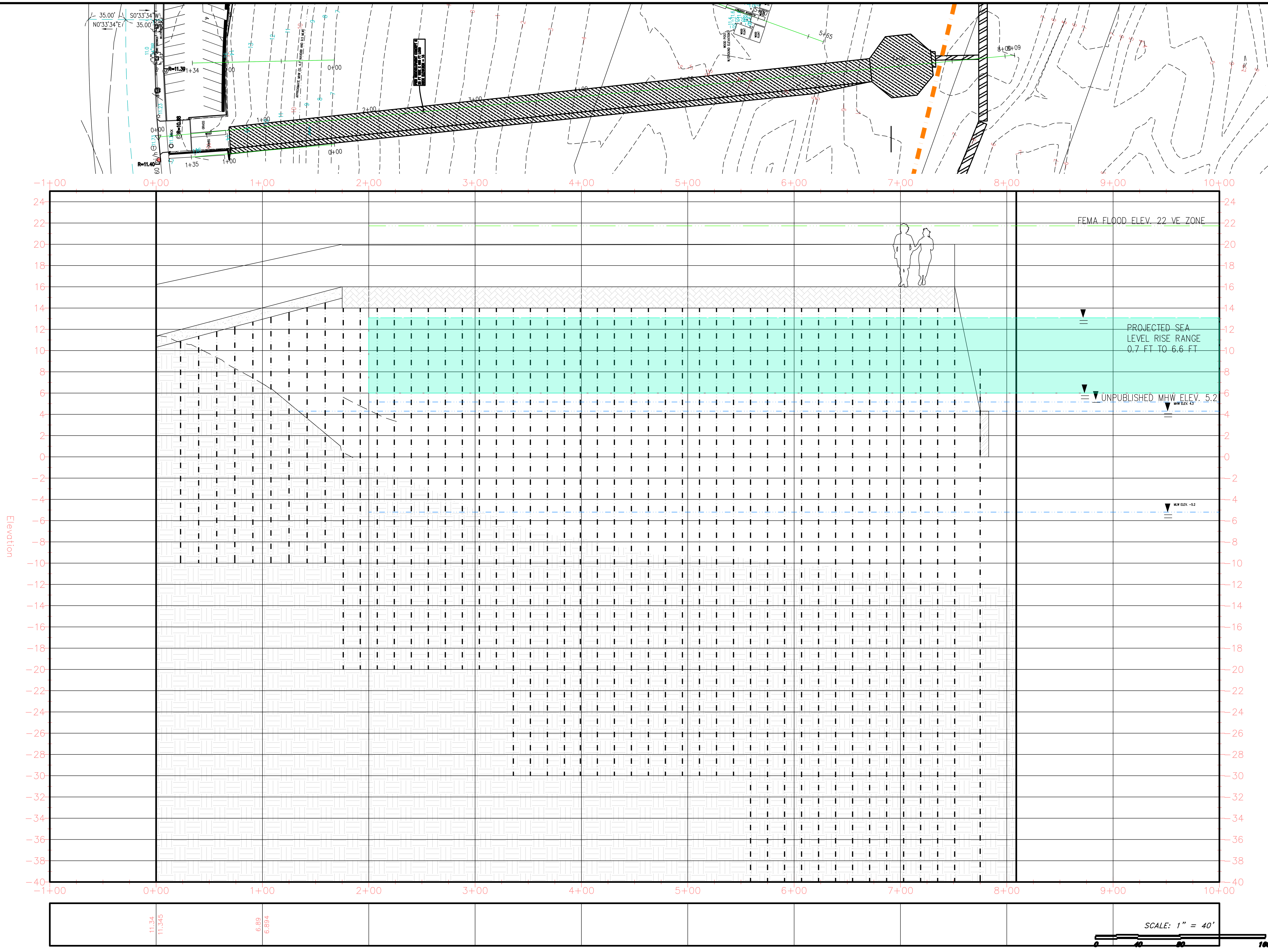
NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 40' CHECK BY: JBM

EXISTING CONDITIONS PLAN PIER PROFILE VIEW

PLOT DATE: Dec 29, 2022 3:46 pm
PATH: C:\Users\jbmm\OneDrive\Documents\JBM\MME\Projects\Swampscott\Plans\

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev5.dwg
LAYOUT: EC PROFILE
SHEET: 1 OF 2
PROJECT NO.: 25476



Swampscott Town Pier Fisherman's Beach #391 HUMPHREY STREET

Swampscott, Massachusetts 01907

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NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/2022 DRAWN BY: RDF
SCALE: 1" = 40' CHECK BY: JBM

CONCEPTUAL PIER LAYOUT 7 PROFILE VIEW

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev5
LAYOUT: PC-7 PROF
SHEET: 2 OF 2
PROJECT NO.: 25476

Attachment D- Geotechnical Data

February 28, 2022

Mr. John McAllister, Principal
McAllister Marine Engineering

RE: Letter of Transmittal - Preliminary Geotechnical Data Letter
Fisherman's Beach, Humphrey Street
Swampscott, MA
(RMA Job No 22115.00)

Dear Mr. McAllister,

The following letter presents a summary of the preliminary geotechnical data obtained by RMA Environmental, LLC (RMA) for the pier replacement project located in Swampscott, Massachusetts. This information is limited to the results of our preliminary field exploration and is subject to the limitations provided at the end. Should you wish to obtain site specific geotechnical parameters and design recommendations at the exploration locations, interpretation of the data by a geotechnical engineer will be necessary. Furthermore, additional investigations may be necessary to obtain site wide data.

SCOPE

1. Coordinate with SAGE EnviroTech (contracted by McAllister Marine) to advance geotechnical borings during one day of drilling.

2. Provided an RMA geotechnical field engineer/geologist at the site to observe borings, obtain and describe the soil samples, and prepare field logs.

3. Prepared this Preliminary Geotechnical Data Letter and attachments containing the results of our subsurface explorations.

Any service not specifically identified in the Scope is excluded

SITE AREA AND BACKGROUND

The site is located on Blaney Beach Park and Fisherman's Beach, both of which are open to the public and owned by the town of Swampscott. A large historic building and dock is located on the property and serves public uses. The building and dock were reportedly constructed in 1900. It is our understanding that the exploration was conducted to support the proposed pier replacement project.

SUBSURFACE INVESTIGATION DATA

A preliminary geotechnical subsurface exploration program, consisting of two (2) borings (RMA22-1 and RMA22-2), was undertaken to provide limited (field) geotechnical data at the referenced site. Automatic hammer blows, split spoon samples, macro (acetate lined) samplers, and dual tube drilling methods were used to collect geotechnical data. Logs of the soil borings are attached to this transmittal and their locations are shown on attached figures.

The subsurface exploration program was performed by SAGE EnviroTech Drilling Services of Pawtucket, Rhode Island (drillers) and observed by RMA personnel (geotechnical engineers) on January 18, 2022. When applicable, split spoon soil samples were generally obtained at 2 foot and 5 foot intervals using a 2 foot long, 1-3/8 inch inside diameter split spoon sampler in substantial conformance with ASTM D-1586. The standard ASTM method of driving

the sampler was employed using a 140-pound automatic hammer falling 30 inches. In some cases, acetate lined macro samplers were driven to obtain a continuous representation of the soil stratum for logging purposes.

The generalized soil profiles described in the text is intended to convey trends in the subsurface conditions. Actual conditions at and/or between the subsurface explorations (i.e. soil borings) will likely vary and may only become apparent during construction. For specific information at each boring, refer to the attached boring logs.

SUMMARY OF GENERALIZED SUBSURFACE CONDITIONS

The depositional environment appears to be comprised of two distinct layers, a beach deposit formed by tidal circulation and potentially disturbed by surface activity, and a layer of fine glacial deposits formed in the marine environment.

Beach Deposits - The stratum encountered within the top 10 to 11 feet of both borings consisted of a beach deposit containing poorly graded sand with gravel (SP with G). This stratum is typical of a coastal beach environment and the soil was likely deposited be tidal circulatory action but may have been disturbed by surface activity (cuffing, filling, etc). Typically, a beach deposit may vary over short distances. The beach deposits were typically loose in density, as blow counts were less than 10 in all but one sample, where the soil was medium dense.

Fine Glacial Deposits (marine) - Underlying the beach deposit layer was a fine glacial stratum consisting of silty clays (CL-for engineering purposes) likely deposited by a combination of glacier- and marine-related processes. This soil layer was found in both borings at 10.5 and 11.5 feet below the ground surface (bgs) near elevation (-)4 feet NAVD88. All borings terminated within this layer at 27 feet bgs. This material was classified as plastic in the field and Clay content increased with depth. Furthermore, as noted on the boring logs and in laboratory test soil descriptions, this material is anticipated to be influenced by marine organics. Blow counts within this layer ranged from 11 to 4, indicating a relative density ranging from stiff to soft. In general, blow counts and densities tended to decrease below the transition zone between the overlying material in correlation with the increasing clay content.

DEPTH BELOW GROUND SURFACE TO TOP OF STRATUM

MATERIAL	RMA22-1 El. 6.5 ft[1]	RMA22-2 El. 7.5 ft[1]
Beach Deposits	GRADE	GRADE
Fine Glacial Deposits (marine)	10.6 feet	11.5 feet
Eob[2]	27 feet	27 feet
Groundwater[3]	2 feet	1 foot

Notes:

1. Ground surface elevation was interpolated to the nearest half foot using elevation contours from the "Existing Conditions Plan of Land In Swampscott, MA"| Dated: 11.11.21 - By: Hancock Associates. We understand the elevations provided in the Existing Conditions Plan are referenced from the North American Vertical Datum of 1988.
2. Scheduled depth (refusal was not encountered)
3. At time of exploration – influenced by tide

GROUNDWATER

Groundwater was observed within all borings between 1 and 2 feet bgs at the time of investigation. Observations occurred between tides, and groundwater is anticipated to be tidally influenced

It should be noted that groundwater levels are known to fluctuate due to local and regional factors including, but not limited to, tidal variations, precipitation events, seasonal changes, and periods of wet or dry weather. Observations made during high tide noted boring one (1) was submerged, and boring two (2) was less than a foot above the peak tide level.

BEDROCK and/or BOULDERS

Refusal (drilling or sampling) on bedrock and/or boulders was not encountered within the scheduled depths of these explorations. As such, the depth and competency of bedrock could not be evaluated. Rock outcrops observed at both headlands to the beach suggest near surface rock is present within the surrounding environs. In addition, boulders in the form of obstruction may be present within the in-situ natural deposits and disturbed material. In general, at any locale, the location and stratigraphy of bedrock should be expected to show considerable variability both laterally and with depth

LABORATORY TESTING:

A suite of laboratory testing was performed on six (6) retrieved samples including four (4) grain size analyses, two (2) Atterberg limit tests, and two (2) corrosivity analysis programs. Disturbed geotechnical samples have been retained by RMA for future geotechnical testing if required. The results of the laboratory testing are summarized and discussed below. The laboratory testing sheets are attached to this transmittal.

Boring No.	Sample ID.	Depth (ft)	Representative Soil Strata	% Gravel	% Sand	% Fines	Atterberg Limits LL | PL | PI
RMA22-1	S-2	2 – 4	Beach Deposit	43.7	53.4	2.9	Non-Plastic
RMA22-1	S-7	25 – 27	Fine Glacial	0.0	1.1	98.9	47 | 20 | 27
RMA22-2	S-1	0 – 2	Beach Deposit	23.7	73.8	2.5	Non-Plastic
RMA22-2	S-4	15 – 17	Fine Glacial	0.0	5.7	94.3	45 | 18 | 27

The laboratory analyses helped refine and confirm the grain size distribution, verified the "SP with G", and "CL" USCS classifications as determined for engineering purposes. See testing sheets for a breakdown of clay vs silt and received moisture contents of plastic samples.

Boring No.	Sample ID.	Depth (ft)	Representative Soil Strata	Sulfate (mg/kg)	Chloride (mg/kg)	pH	Electrical Resistivity at 60°F (Ohm-cm) As Received | Saturated
RMA22-1	S-2	2 – 4	Beach Deposit	512	3360	6.5	183 | 178
RMA22-2	S-4	15 – 17	Fine Glacial	34	97	6.8	1300 | 1300

Corrosivity analysis determined the soil stratums to be highly corrosive. Corrosivity decreased marginally with depth.

We trust that this data letter and attachments are sufficient for your needs for your project located at Fisherman's Beach in Swampscott, MA. If you have any comments or questions, please contact me by phone (401) 741.9667 or by email at josh@rmahydro.com.

Sincerely,

RMA Environmental

Joshua E. Rosenberg, P.E.
Principal

Ethan Smith
Staff Engineer

Attachments:
See Transmittal Cover Sheet

Geotechnical Data Transmittal Limitations

General

1. This is a geotechnical exploration data transmittal, and not a geotechnical letter or report. No interpretations or recommendations, either expressed or implied, are intended or made. Should you wish to obtain site specific geotechnical parameters and/or design recommendations at the exploration locations, interpretation of the data by a geotechnical engineer will be necessary.

Explorations

1. The geotechnical data (data) in this transmittal is preliminary and is specific to the data obtained from the two (2) subsurface explorations performed at/on the indicated locations/dates. Additional investigations may be necessary to obtain site wide data. As such, this data does not reflect variations that may occur between explorations, across the site, or due to the modifying effects of weather. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations then appear evident, RMA Environmental, LLC (RMA) should be immediately notified and asked to reevaluate the information provided in this transmittal.
2. The generalized soil profile described in the text is intended to convey trends in the subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of preliminary and widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.
3. Water level readings have been made in the drill holes at the times and under the conditions stated on the boring logs. However, fluctuations in the level of groundwater may occur due to variations in tides, rainfall, temperature, and other factors occurring since the time the measurements were made

Review and Construction

1. RMA cannot accept responsibility for recommendations, conclusions, or designs based on data provided in this transmittal unless we are engaged to review and provided comment on such recommendations, conclusions, or designs. RMA or the geotechnical engineer of record should be retained to provide soil engineering services during construction phases of work in order to observe compliance with any geotechnical recommendation interpreted from this data.

Use of Data

1. This Geotechnical data has been transmitted for the exclusive use of McCallister Marine Engineering, LLC. and their Client (Town of Swampscott) for specific application to the pier replacement project located at Fisherman's Beach in Swampscott, MA - in accordance with generally accepted engineering practices. No warranties, either expressed or implied, are intended or made for any other use by another party. This is not a report for design purposes

0 1,000 2,000 4,000 Feet

MASS GIS

esri

20 MAIN STREET
WICKORD, RI

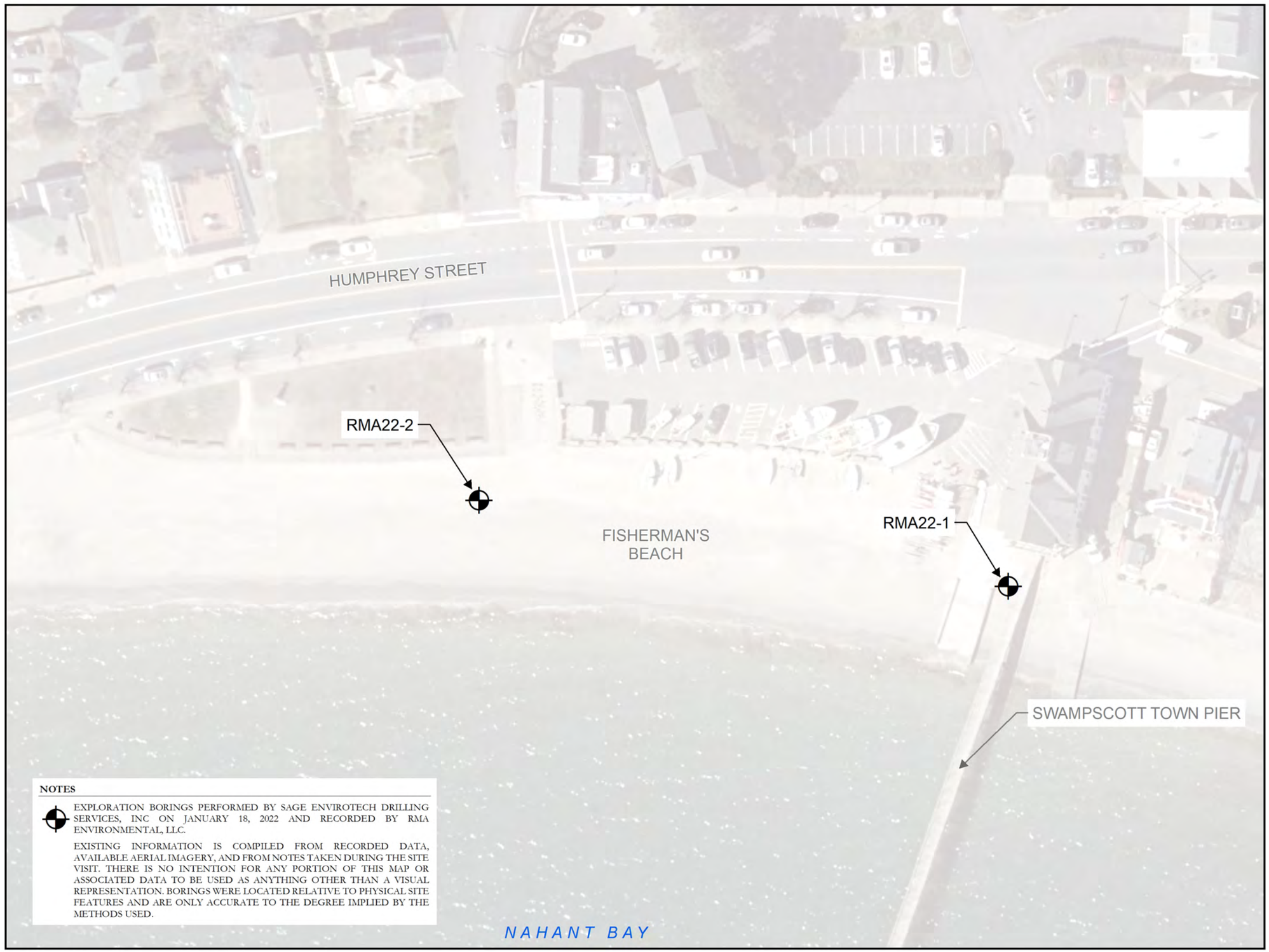
N

RMA GeoEnvironmental

DRAWING TITLE		PROJECT	
LOCUS MAP		FISHERMAN'S BEACH PRELIMINARY GEOTECHNICAL INVESTIGATION DATA	
PROJECT No: 22115.00	DRAWING No.:	OWNER/CLIENT	
DATE: 2/28/2022	V-1	MCCALLISTER MARINE ENGINEERING	
SHEET No. 1 OF 2			
SCALE: AS NOTED			

www.RMAHYDRO.com

SITE ★



NOTES

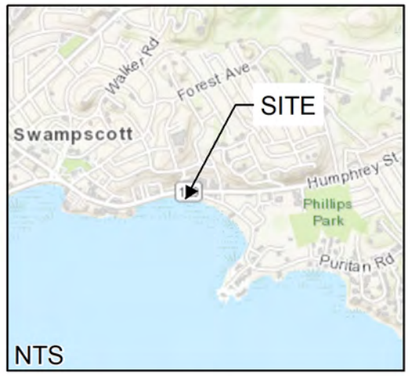
EXPLORATION BORINGS PERFORMED BY SAGE ENVIROTECH DRILLING SERVICES, INC ON JANUARY 18, 2022 AND RECORDED BY RMA ENVIRONMENTAL, LLC.

EXISTING INFORMATION IS COMPILED FROM RECORDED DATA, AVAILABLE AERIAL IMAGERY, AND FROM NOTES TAKEN DURING THE SITE VISIT. THERE IS NO INTENTION FOR ANY PORTION OF THIS MAP OR ASSOCIATED DATA TO BE USED AS ANYTHING OTHER THAN A VISUAL REPRESENTATION. BORINGS WERE LOCATED RELATIVE TO PHYSICAL SITE FEATURES AND ARE ONLY ACCURATE TO THE DEGREE IMPLIED BY THE METHODS USED.

0 25 50 100 Feet

N

RMA GeoEnvironmental



PROJECT

FISHERMAN'S BEACH
PRELIMINARY GEOTECHNICAL
INVESTIGATION DATA

OWNER / CLIENT

MCCALLISTER MARINE
ENGINEERING

DRAWING TITLE

EXPLORATION LOCATION MAP
FISHERMAN'S BEACH
HUMPHREY STREET
SWAMPSCOTT, MA 01907

PROJECT No: 22115.00	DRAWING No.:
DATE: 2 / 28 / 2022	EX - 1
SHEET No. 2 OF 2	
SCALE: AS NOTED	

RMA ENVIRONMENTAL LLC

20 MAIN STREET, WICKFORD, RHODE ISLAND 02852

ENGINEERS *** SCIENTISTS *** GIS SPECIALISTS

BORING NO. **RMA22-1**

SHEET 1 OF 1 1

PROJECT	Swampscott Beach Geotech	PROJECT NO.	22115.00
	Swampscott, MA	CHKD. BY	draft
BORING CO.	Sage Envirotech	BORING LOCATION	SEE EXPLORATION LOCATION PLAN
FOREMAN	Steve Perry	GROUND SURFACE ELEVATION	6.5 DATUM NAVD88
ENGINEER	Ethan Smith	DATE START	1/18/2022 DATE END 1/18/2022

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.

CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300 lb. HAMMER FALLING 24 IN.

CASING SIZE: 3.25" OTHER:

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
1/18/2022		2'		End of Boring

DEPTH (ft)	CASING (bl/ft)	SAMPLE NO.	PEN. (in.)/ REC.	DEPTH (FT)	BLOWS/6"				TONS/FT^2 OR KG/CM^2	SAMPLE DESCRIPTION Burmister CLASSIFICATION	REMARKS	STRATUM DESCRIPTION
1		S-1	24 18	0-2	1	2	7	8		Loose, wet, tan/grey, F/M SAND, little gravel, trace silt		
2												
3		S-2	24 10	2-4	4	4	5	4		Loose, wet, tan/grey, F/M SAND and gravel, trace silt, trace marine organics, cobble in tip		
4												
5												
6		S-3	24 24	5-7	2	3	3	5		Loose, wet, tan, F/M SAND		Beach Deposits
7												
8												
9												
10												
11		S-4	24 24	10-12	2	6	13	18		4A (first 7")- Loose grey, F/M SAND, trace Silt		
12												10.5'
13										4B (last 17")- Hard, wet, green/grey, SILT, little to some Clay, trace F Sand		
14												
15												
16		S-5	24 24	15-17	3	5	6	8		Stiff, wet , green/grey, SILT, some to and Clay, trace fine Sand		
17												
18												
19											2	Fine Glacial
20												
21		S-6	24 24	20-22	3	3	4	5		M. Stiff, wet, green/grey, SILT, some to and Clay, trace F Sand		
22												
23												
24												
25												
26		S-7	24 24	25-27	2	2	2	2		Soft, wet, green/grey, CLAY and Silt		
27												27'
28												End of Boring
29												
30												
31												
32												

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0 - 4	V. LOOSE	<2	V.SOFT
4 - 10	LOOSE	2 - 4	SOFT
10 - 30	M.DENSE	4 - 8	M.STIFF
30 - 50	DENSE	8 - 15	STIFF
>50	V.DENSE	15 - 30	V.STIFF
		>30	HARD

REMARKS:

1. Automatic Hammer / Geoprobe Hammer for Casing
2. Fine Glacial generally observed to be plastic. Plasticity/texture of samples increased with depth and anticipated to be influenced by marine organics

BURMISTER CLASSIFICATION	
TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%
PERCENT BY WEIGHT	

NOTES:

1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.
3) THE GROUND SURFACE ELEVATION WAS INTERPOLATED TO THE NEAREST 1/2 FOOT BASED ON A DRAWING TITLED: "PROPOSED BORING LOCATIONS FISHERMA'S BEACH" PREPARED BY HANCOCK ASSOCIATES, DATED 11/11/2021

Fine	F
Medium	M
Coarse	C

BORING NO. **RMA22-1**

RMA ENVIRONMENTAL LLC

20 MAIN STREET, WICKFORD, RHODE ISLAND 02852

ENGINEERS *** SCIENTISTS *** GIS SPECIALISTS

BORING NO. **RMA22-2**

SHEET 1 OF 1 1

PROJECT	Swampscott Beach Geotech	PROJECT NO.	22115.00
	Swampscott, MA	CHKD. BY	draft
BORING CO.	Sage Envirotech	BORING LOCATION	SEE EXPLORATION LOCATION PLAN
FOREMAN	Steve Perry	GROUND SURFACE ELEVATION	7.5 DATUM NAVD88
ENGINEER	Ethan Smith	DATE START	1/18/2022 DATE END 1/18/2022

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.

CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300 lb. HAMMER FALLING 24 IN.

CASING SIZE: 3.25" OTHER:

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
1/18/2022		1'		End of Boring

DEPTH (ft)	CASING (bl/ft)	SAMPLE NO.	PEN. (in.)/ REC.	DEPTH (FT)	BLOWS/6"				TONS/FT^2 OR KG/CM^2	SAMPLE DESCRIPTION Burmister CLASSIFICATION	REMARKS	STRATUM DESCRIPTION
1		S-1	24 18	0-2	2	6	3	7		Loose, moist, grey/tan, F/M SAND, some Gravel, trace shells and silt		
2												
3												
4												
5												Beach Deposits
6		S-2	24 24	5-7	2	3	4	5		Loose, wet, grey/tan, F/M SAND		
7												
8												
9												
10												
11		S-3	24 16	10-12	4	7	3	6		3A (top 18") - M. Dense wet, grey/tan, F/M SAND, some Gravel		11.5'
12												
13										3B (bottom 6") - M. Stiff wet, green/grey, SILT, some Clay, trace F Sand		
14												
15												
16		S-4	24 24	15-17	3	3	4	6		M. Stiff, wet, grey/tan, SILT and Clay, trace F Sand, trace organics	2	
17												
18											3	
19												Fine Glacial
20												
21		S-5	24 24	20-22	2	1	3	4		Soft, wet, green/grey, CLAY and Silt, trace organics	2	
22												
23												
24												
25												
26		S-6	24 24	25-27	4	2	3	3		M. Stiff, wet, grey/tan, CLAY and Silt		
27												27'
28												End of Boring
29												
30												
31												
32												

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0 - 4	V. LOOSE	<2	V.SOFT
4 - 10	LOOSE	2 - 4	SOFT
10 - 30	M.DENSE	4 - 8	M.STIFF
30 - 50	DENSE	8 - 15	STIFF
>50	V.DENSE	15 - 30	V.STIFF
		>30	HARD

REMARKS:

1. Automatic Hammer / Geoprobe Hammer for Casing
2. Fibrous marine matter in spoon
3. Fine Glacial generally observed to be plastic. Plasticity/texture of samples increased with depth and anticipated to be influenced by marine organics

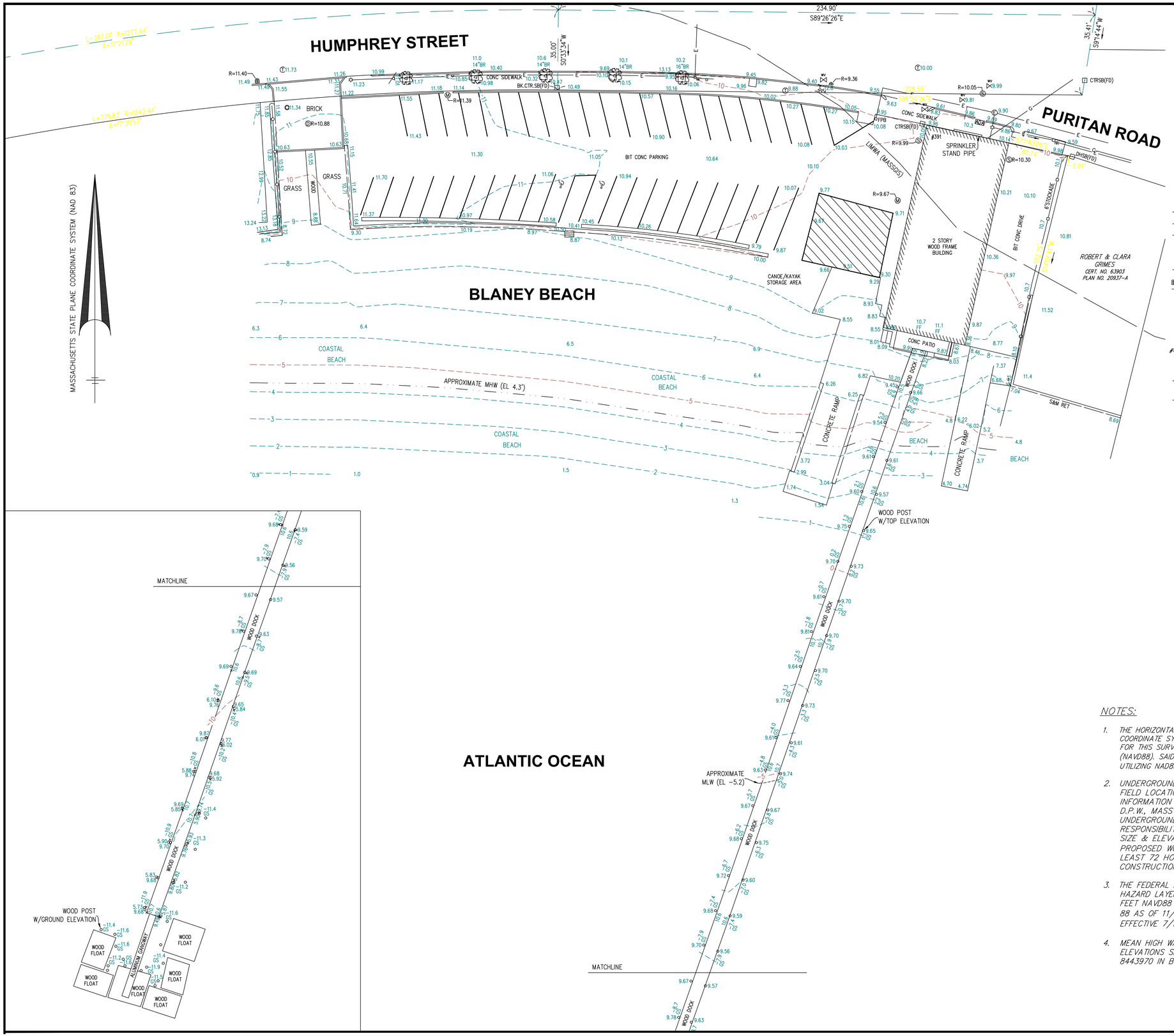
BURMISTER CLASSIFICATION	
TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%
PERCENT BY WEIGHT	

NOTES:

1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.
3) THE GROUND SURFACE ELEVATION WAS INTERPOLATED TO THE NEAREST 1/2 FOOT BASED ON A DRAWING TITLED: "PROPOSED BORING LOCATIONS FISHERMA'S BEACH" PREPARED BY HANCOCK ASSOCIATES, DATED 11/11/2021

Fine	F
Medium	M
Coarse	C

BORING NO. **RMA22-2**



ASSESSORS:

MAP 19, LOT 278A

REFERENCES:

NO REFERENCES WERE AVAILABLE FOR LOCUS

RECORD OWNER:

TOWN OF SWAMPSCOTT

ZONING: A4

LEGEND

102	SURFACE CONTOUR
	EDGE OF PAVEMENT
	WOOD FENCE
86.75 / 86.25	CURB WITH TOP AND BOTTOM CURB ELEVATION
S 8"CI S	SEWERLINE & MANHOLE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION
D 12"RCP D	DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
W 6"CI	WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
G 10"DI	GAS MAIN WITH SIZE & GATE VALVE
#181 OHW	EXISTING UTILITY POLE WITH DESIGNATION OVERHEAD WIRES AND GUY POLE
E	ELECTRIC MANHOLE & UNDERGROUND ELECTRIC LINES
T	TELEPHONE MANHOLE & UNDERGROUND TELEPHONE LINES
98.8 / 93.2	RETAINING WALL WITH TOP AND BOTTOM ELEVATIONS
× 100.7	SPOT ELEVATION
93.7 12"M	PROMINENT DECIDUOUS TREE WITH ELEVATION, SIZE AND SPECIES
	LIGHT POLE
SMH S	SEWER MANHOLE
DMH D	DRAIN MANHOLE
CB	CATCH BASIN
	D GRATE CATCHBASIN
	BOLLARD
	SIGN
DHSB	DRILL HOLE IN STONE BOUND
CTR. BK.	CENTER BACK
VGC	VERTICAL GRANITE CURB
BIT. CONC.	BITUMINOUS CONCRETE
GS	ELEVATION AT GROUND
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE
CPP	CORRUGATED PLASTIC PIPE
LIMWA	LIMIT OF MODERATE WAVE ACTION FROM MASSGIS DATA
MHW	MEAN HIGH WATER
MLW	MEAN LOW WATER

NOTES:

1. THE HORIZONTAL DATUM FOR THIS SURVEY IS THE MASSACHUSETTS COORDINATE SYSTEM, NAD 1983, MAINLAND ZONE. THE VERTICAL DATUM FOR THIS SURVEY IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). SAID DATUMS WERE ESTABLISHED VIA GPS OBSERVATIONS UTILIZING NAD83 (NA2011) EPOCH 2010.00 (MYCS2) AND GEOID 18.
2. UNDERGROUND UTILITIES SHOWN HEREON ARE COMPILED FROM FIELD LOCATIONS OF STRUCTURES AND FROM AVAILABLE RECORD INFORMATION ON FILE AT THE TOWN ENGINEERING OFFICES, TOWN D.P.W., MASS HIGHWAY DEPT. AND UTILITY COMPANIES. OTHER UNDERGROUND UTILITIES MAY EXIST. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION, SIZE & ELEVATION OF ALL UTILITIES WITHIN THE AREA OF PROPOSED WORK AND TO CONTACT "DIG-SAFE" AT 811 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION, DEMOLITION OR CONSTRUCTION.
3. THE FEDERAL EMERGENCY MANAGEMENT AGENCY NATIONAL FLOOD HAZARD LAYER VIEWER DESIGNATES AN AE ZONE ELEVATION OF 15 FEET NAVD88 AS WELL A VE ZONE ELEVATION OF 22 FEET NAVED 88 AS OF 11/10/2021. (REF: MAP NUMBER 25009C0418G, EFFECTIVE 7/16/2014).
4. MEAN HIGH WATER (MHW) AND MEAN LOW WATER (MLW) ELEVATIONS SHOWN HEREON ARE FROM NOAA TIDE STATION 8443970 IN BOSTON, MA.

SCALE: 1" = 20'

0 20 40 80

Swampscott Town Pier Fisherman's Beach #391 HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

TOWN OF SWAMPSCOTT, MA

22 Monument Avenue
Swampscott, MA 01907

MCALLISTER MARINE ENGINEERING

16 Hoxie Street
Charlestown, Rhode Island 02813

HANCOCK ASSOCIATES
Civil Engineers
Land Surveyors
Wetland Scientists

185 CENTRE STREET, DANVERS, MA 01923
VOICE (978) 777-3050, FAX (978) 774-7816
WWW.HANCOCKASSOCIATES.COM

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 11/11/2021	DRAWN BY: RDF
SCALE: 1" = 20'	CHECK BY: WCJ

EXISTING CONDITIONS PLAN OF LAND IN SWAMPSCOTT, MA

PLOT DATE: Nov 23, 2021 - 8:03 pm
PATH: C:\Users\johnm\OneDrive\Documents\LBM\MME\Projects\Swampscott\Plans\2021-

DWG: Swampscott Fisherman's Pier Plan.dwg	
LAYOUT: EC	
SHEET: 1 OF 1	
PROJECT NO.:	25476

Attachment E- Eelgrass Assessment Report and Figures

MEGALODON
ENVIRONMENTAL LLC

Prepared for:

McAllister Marine Engineering
16 Hoxie Street
Charlestown, Rhde Island 02813
and
Town of Swampscott, MA
22 Monument Avenue
Swampscott, MA 01907

Eelgrass Habitat Assessment

Fisherman's Beach #391 Humphrey Street, Swampscott, MA
Proposed Pier Renovations and Nature Based Coastal Resilience Projects

Prepared by

Megalodon Environmental, LLC
P.O. Box 329
Woods Hole, MA 02543

Dr. Pamela Neubert
Mr. Darron Kriegel
508-274-2790

MEGALODON
ENVIRONMENTAL LLC

1.0 Introduction

Megalodon Environmental, LLC (Megalodon) was asked to perform an assessment of eelgrass (*Zostera marina*) habitat in an area encompassing approximately 136 acres by McAllister Marine Engineering (MME). The results of Megalodon's assessment are to assist MME with providing the Town of Swampscott (Town) with information for siting of their proposed Fishermen's Pier renovation and reconstruction project as well as where, if any, underwater nature-based structures such as submerged rocks could be placed without affecting eelgrass habitat. The submerged rock jetty is proposed to address the Town's resilience concerns regarding loss of beachfront habitat from dynamic tidal activity and currents, particularly during storm events.

Eelgrass is a submerged aquatic plant, found from the low tide mark to approximately 5 meters water depth in the New England region. Eelgrass beds grow in shallow bays and coves, tidal creeks, and larger estuaries. Healthy eelgrass beds comprise important essential fish and shellfish habitat, providing protection and food for juveniles of several fish and shellfish. Eelgrass throughout New England has undergone widespread reductions during the last fifty years. It is believed that the decline of eelgrass habitat has been caused by activities that have led to reduction in water quality, particularly nitrogen loading that subsequently reduced water clarity limiting light to the plants.

The Megalodon team consisted of Mr. Darron Kriegel performing the eelgrass habitat assessment with three representatives from MME. The MME team was responsible for side-scan sonar, bathymetric data, video camera data collection and the development of seafloor mosaic imagery that assisted with Megalodon's interpretation of the location where eelgrass was located. Dr. Pamela Neubert and Mr. Kriegel were responsible for the eelgrass assessment based upon the data obtained and produced by MME. Dr. Neubert and Mr. Kriegel have worked collaboratively on eelgrass and benthic habitat assessment projects over the past 7 years. Dr. Neubert has been performing habitat assessments for eelgrass and shellfish for over 20 years throughout New England including Town and Cities throughout coastal Massachusetts. Her resume is included within Appendix A. The proposed Project location is provided within **Figure 1**.

2.0 General Site Description

The Town is determining if relocating and/or rebuilding in place the existing Pier would provide a move viable solution for fishermen and to place a living reef structure in the subtidal area to protect vesels in the harbor, the historic Fish House, and the beach from erosion, especially during storm events. The living reef structure (details to be designed at a future date) would provide three-dimensional structures on the largely two-dimensional seafloor that would attract fish and shellfish as well as provide habitat for algal growth that could buffer current and tidal action and reduce beach loss during storm events. Fishermen's Pier is heavily utilized during the spring, summer, and fall months and to a lesser degree in the winter. The water in the study area of the proposed work is shallow (<20 feet).

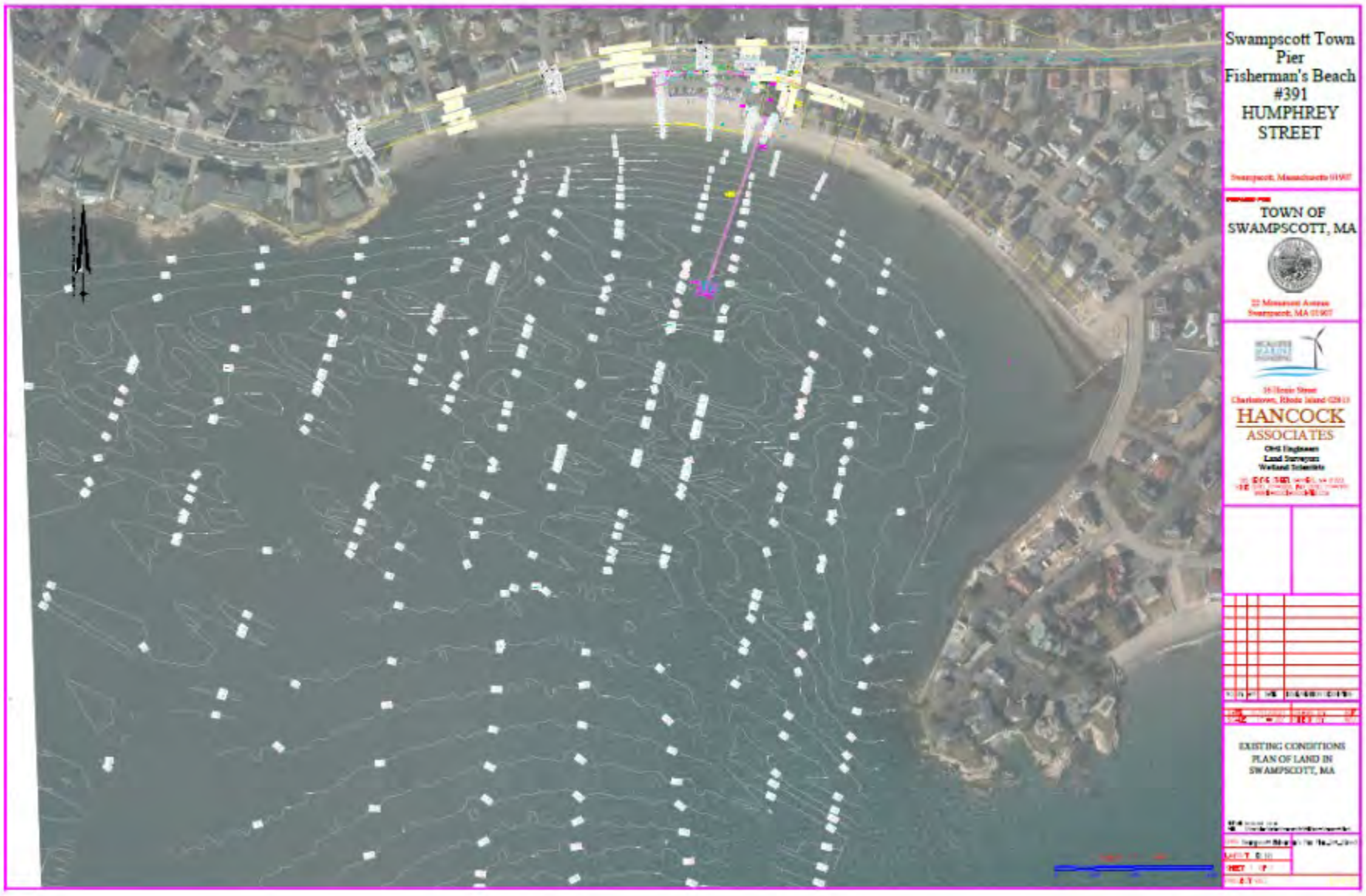


Figure 1. Proposed Project Location.

3.0 Methodology

The eelgrass assessment was performed on July 29, 2022 in collaboration with hydrographic data collection that was obtained during the week of July 24, 2022. Field survey work was completed by July 30, 2022. The first order to obtain data that would be assessed for eelgrass habitat was to obtain bathymetric data. Once bathymetry was completed MME switched to using side-scan sonar to obtain the seafloor data along transects and then the results from the side-scan efforts were rendered using software that formed a seafloor mosaic image. During the survey effort to obtain seafloor geophysical data, a submarine video camera was utilized to observe seafloor conditions and ground-truth signatures on the seafloor to differential eelgrass habitat from sandy-bottom and potential algae. **Figure 2** shows results of the side-scan mosaic imagery within the surveyed area with the location of video transects performed for eelgrass habitat ground-truthing. **Figure 3** shows an area defined by Megalodon as potential eelgrass area compared with Massachusetts Department of Environmental Protection (MADEP) 2016 eelgrass delineation. **Figure 4** presents screenshots from the seafloor video associated with the ground-truthing effort specifically identified within eelgrass and non-eelgrass areas as shown within **Figure 3**.

MME used a shallow-draft vessel to conduct the hydrographic survey and eelgrass assessment. The following equipment was used to complete the hydrographic survey work:

- Fathometer equipment – an odom single beam acoustic echo sounder and Leica Viva GS10 RTK GPS
- The survey system was to acquire X, Y (horizontal) and z (vertical) positions in the North American Datum (NAD83) in local State Plane Coordinates. Depths were referenced to the standard NAVD 88 baseline used by the US Army Corps of Engineers and the US Geological Survey. Depth data was recorded along with the navigation information for the vessel using the fathometer and a digital Global Positioning System (GPS).
- System accuracy was checked periodically by comparing echo depth measurements to known water depths obtained using the “bar check” method and by collecting water column profiles of sound velocity.

The eelgrass habitat assessment was conducted utilizing a Klein 3900 Side-scan Sonar and a SplashCam towed underwater camera to delineate eelgrass habitat within the assessment footprint. The video camera was deployed as the main mechanism to ground-truth the presence or absence of eelgrass habitat signatures that are observed from the side-scan sonar. After the data was collected it was processed using Hypack for the bathymetric data and Sonarwiz for the side scan data. Once the mosaics were compiled, the MME geophysicists used QGIS and Globalmapper to create georeferenced TIFs.

4.0 Results

The result of the eelgrass habitat assessment based on video ground-truth and side-scan imagery suggest there is a large area occupied by eelgrass as outlined in **Figure 3**. The area of eelgrass is much larger than what was identified by Massachusetts Department of Environmental Protection (MADEP) in 2016. We understand that MADEP used aerial imagery for assessing eelgrass in 2016 with limited to no ground-

truthing by video camera in certain areas and did not perform geophysical seafloor data collection due to limitations of budget and time constraints. The 2022 data collected by MME suggests that the area where eelgrass is located within Swampscott Harbor extends seaward beyond the MADEP 2016 study for a total habitat area of approximately 71 acres. The area is not consistently covered with 100% eelgrass habitat within the polygon shown in **Figure 3**. In order to fine-scale areas within the larger area identified to have presence of eelgrass to determine if there are locations large enough for placement of a living reef structure for shoreline stabilization then additional studies utilizing diver-based assessment is required to provide the Town with definitive delineation of eelgrass percent coverage as well as presence/absence for proper siting efforts.

5.0 Conclusions

Based on Megalodon's observations and the data collected, it is our opinion that the Town of Swampscott can move their Fisherman's Pier to a new location along Fisherman's Beach or rebuild in a similar footprint to the existing pier, as the pier will not affect existing eelgrass habitat. However, the Town is proposing to create a living reef, which may require they place large, submerged rocks, and/or ecologically sensitive concrete blocks to serve as an underwater jetty type structure and these nature-based resilience solutions need to be places in areas to avoid eelgrass habitat. The western portion of the proposed project (Figure 3) does not show ground-truthing that suggests eelgrass is present and it is within this location that Megalodon recommends placing these submerged structures. Should the Town decide to place these submerged structures within the area defined in Figure 3 as potential eelgrass habitat then we recommend site-specific and finer-scaled delineation take place using underwater divers to determine if an area is devoid of eelgrass. Our results suggested that the 2016 MADEP eelgrass mapping area is not sufficiently identifying the full extent of potential eelgrass habitat in the area. The optimal timeframe for dredging should be within a work window of November 15 and February 15 of any given year to avoid impacts to essential fish habitat, in particular winder flounder (*Pseudoplueronectes americanus*) spawning timeframe.

Figure 2. Side-scan sonar mosaic Town of Swampscott Fisherman's Beach Project Obtained from MME.

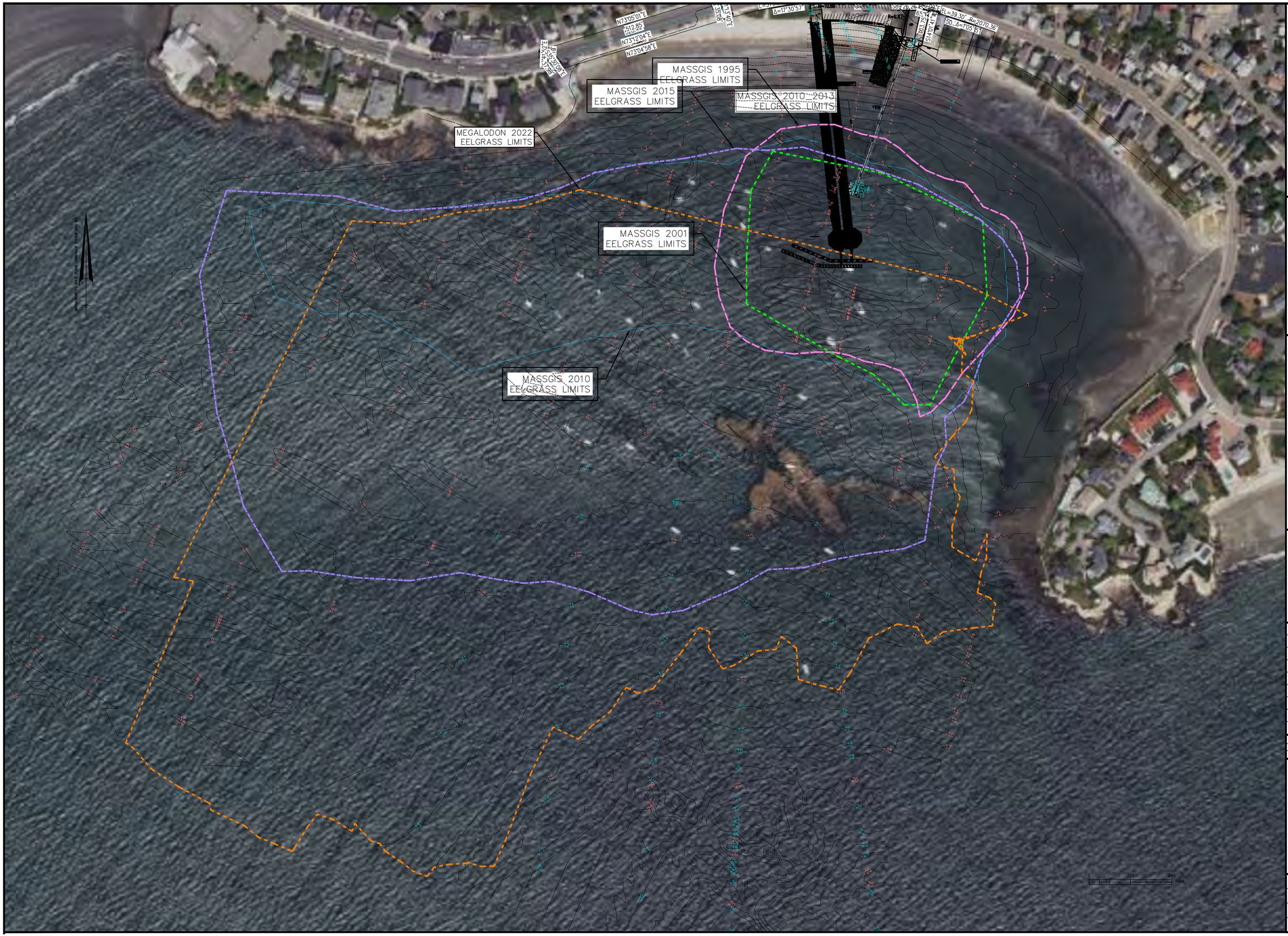
Figure 3. Potential Eelgrass Area Based Upon Side-Scan Mosaic and Seafloor Video Ground-truthing with MADEP Eelgrass 2016 Delineation.

Figure 4. Screenshot images from video segments obtained on July 29, 2022.

Dense eelgrass habitat 141952-1 associated with Transect 15:06:00.

Patchy eelgrass habitat 141952-1 associated with Transect 15:34:232.

Nearshore benthic algae, most likely *Ulva latuca* 14155-1 associated with Transect 15:49:198.



Swampscott Town Pier
Fisherman's Beach #391
HUMPHREY STREET

Swampscott, Massachusetts 01907

PREPARED FOR:

TOWN OF SWAMPSCOTT, MA

22 Monument Avenue
Swampscott, MA 01907

MCALLISTER MARINE ENGINEERING

16 Hoxie Street
Charlestown, Rhode Island 02813

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 12/29/2022 DRAWN BY: JBM
SCALE: 1" = 120' CHECK BY: JBM

EELGRASS MAPPING CHANGE SWAMPSCOTT HARBOR SWAMPSCOTT, MA

PLOT DATE: Dec 29, 2022 12:02 pm
PATH: C:\Users\jbmm\OneDrive\Documents\JBM\MME\Projects\Swampscott\Plans\

DWG: Swampscott Fisherman's Pier Plan_Oct_22rev5.dwg
LAYOUT: EG-1
SHEET: 1 OF 1
PROJECT NO.: 25476