GRANT APPLICATION

Hazard Mitigation Grant Program (HMGP)
HMGP-4372-MA
HMGP-4379-MA

Little Beach Dune Stabilization Project

Chatham, Massachusetts
April 2019

Prepared for:
Little Beach Association
PO Box 668
Chatham, MA 02633
&
The Town of Chatham
261 George Ryder Road
Chatham, MA 02633

Prepared by:
Horsley Witten Group, Inc.

SUBAPPLICATION PACKAGE FOR THE HAZARD MITIGATION GRANT PROGRAM

Exhibit A: SUB-APPLICATION COVER SHEET

Sub-Application Information

Sub-Applicant _Town of Chatham_____

County __Barnstable_____ Congressional District _9th Congressional District_

Fed Tax ID _046-001-110_____ FIPS Code __25001_____

DUNS Number 076623768_____

Community in good standing with the National Flood Insurance Program? _____X___Yes
_____No

Project Title _
Little Beach Dune Stabilization_____

Authorized Applicant Agent[1]		**Point of Contact**[2]
Jill R. Goldsmith	Name	Robert A. Duncanson, Ph.D.
Town Manager	Title	Director of Health & Natural Resources
508-945-5105	Telephone #	508-945-5165
549 Main St.	Address 1	261 George Rd.
	Address 2	
Chatham, MA 02633	City, State Zip	Chatham, MA 02633
jgoldsmith@chatham-ma.gov	Email	rduncanson@chatham-ma.gov

[1] Individual authorized to sign certification (i.e. Contractor Authorized Signatory Listing)
[2] Individual that the sub-applicant wishes the State (MEMA/DCR) to contact/email for additional information/questions regarding the sub-application (i.e. primary point of contact)

Are all of the Exhibits complete and attached to the application as required? ____X___Yes _____ _____No

Project Type: Non-localized Flood Risk Reduction

(From 2015 HMA Guidance, Part III, Table 3.)

Introductory Statement (Brief Summary of Project):

The proposed project involves improving coastal resiliency of the Little Beach neighborhood in Chatham, Massachusetts, by elevating and stabilizing the coastal dune, elevating the marina bulkhead, and elevating a privately-owned retaining wall. Elevation along this shoreline stretch range from 5 to 8 feet NAVD88. Project proposes to raise the elevation to a standard height of 9 feet or higher. Elevation 9 will provide protection against future storms and floodwater from the ocean.

Physical Address of Project:

The proposed project is located at Little Beach, Chatham, Massachusetts. Project spans the following addresses: __

(if multiple, list all addresses):
65 Edgewater Dr
83 Seagull Road
4-28 Starfish Lane
53 Little Beach Road
14 Windmill Lane
16 Windmill Lane
24 Windmill Lane

Latitude: 41.665452 Longitude: -69.953595

Benefit Cost Ratio: 1.44

Performance Period in Months: 36 months

Has this project been submitted to or approved by any other Federal or State agency for funding?
_____Yes _____X___No _____Unknown

If Yes, provide the following information:

Agency Name _____

Address _____

_____

Contact Name _____

Phone Number _____

Amount $_____

Mitigation Plan Status

Please indicate the status of the Multi-Hazard Mitigation Plan (plan must meet requirements of 44 CFR Part 201):

_____No Plan

_____Expired Plan

____X__FEMA-Approved. FEMA approval date: _May 21, 2018_____

_____Other. Please Explain:

Public Notice/Official Newspaper Information

Community's official newspaper

Name _____Cape Cod Chronicle_____

Address _____60C Munson Meeting Way_____

_____Chatham, MA 02633_____

Telephone # ___508-945-2220_____

Sub-Application Prepared by:

Signature _____ Date 04/02/2019

Printed Name Tara Nye Lewis

Title Senior Coastal Ecologist, Horsley Witten Group, Inc.

PART B: SCOPE OF WORK

Introductory Statement:

This project is to increase flood protection and improve resiliency along a 2,755-foot stretch of shoreline on the Atlantic Ocean side of the Little Beach neighborhood of Chatham. Work includes raising the dune height on the landward side of the normal high water mark from a low of approximately 5.5 feet (ft) NAVD88 to a minimum of 9.0 feet NAVD88 for beach and dune northeast of the Oceanfront Condominiums to Windmill Lane (a distance of approximately 940 linear feet [LF]) and southwest of Outermost Harbor Marine (OHM) towards Edgewater Drive (approximately 640 LF). Project also includes raising the bulkhead at Outermost Harbor Marine from approximately elevation 6.0 ft NAVD88 to 9.0 ft NAVD88 and related measures for approximately 840 linear feet. Project will also replace an existing retaining wall (135 ft) and provide increased stabilization for a newly constructed dune in front of the Oceanfront Condominiums (200 ft). At the conclusion of the Project, the Little Beach neighborhood will be protected from floodwaters, storm surge, and wave action emanating from the Atlantic Ocean to elevation 9.0 ft NAVD88. This compares to a record storm height of 7.74 ft NAVD88 encountered in 2016 and current elevations of just under 5.0 ft NAVD88 where flooding begins. Five flood events occurred in 2018 where portions of the Little Beach neighborhood were inundated. The project will protect Little Beach and Morris Island Roads from coastal storms of the type that occurred during the early 2018 year. Flooding blocked vehicular access to approximately 130 homes for several days and damaged several structures including the marina. The Project will eliminate the need to pump seawater from low-lying areas, landward of the dunes, and maintain public safety and residential vehicular access to Little Beach, the Stage Island, and Morris Island. The Project will protect Little Beach homes from flood water inundation, avoid saltwater damage and destruction of trees and other vegetation, and protect underground utility services.

Statement of Need:

The proposed Project is designed to reduce, minimize and eliminate the frequency and severity of flooding and to decrease predicted flood damage within the community. This will be achieved by stabilizing and elevating existing natural and manmade allowing the community to be more resilient to disasters. This proposed mitigation will allow the Town of Chatham to build a stronger, safer and smarter community, and reduce future injuries and damages.

Source of hazards impacting Little Beach are storm tides and surges that exceed the elevation of current shoreline structures (natural and/or man-made). The Center for Coastal Studies conducted a floodtide pathways study for Little Beach (*Mapping Storm Tide Pathways in the Little Beach Area of Chatham, Massachusetts*, August 2018) identifying 15 flood pathways from the Atlantic Ocean. These pathways can be eliminated by raising the shoreline structures. Currently, these structures can be overtopped starting at approximately elevation 4.5 NAVD88. Flooding from storms can inundate streets and roadways; flood lower elevations of homes and the marina; prevent access for public safety entities and owners for days or weeks; and damage improved property including pavement, structures, vegetation, and underground utilities.

Implementation of the Project will increase coastal resiliency on the Atlantic Ocean side of Little Beach to elevation 9 NAVD88 which will prevent flooding of the street network. Including Morris Island, Stage Neck, and Little Beach Roads that serve 184 homes and properties, as well as Outermost Harbor Marine. This will also eliminate floodwaters from collecting in low areas requiring several days pumping in order for residents, utilities, and marina operations to safely access properties using the street system.

Morris Island is also the site of the headwaters of U.S. Fish and Wildlife Service Monomoy National Wildlife Refuge and a Weather Service Facility. Outermost Harbor Marine is used by the USCG, Chatham Harbormaster, Chatham Fire Department and others for access to eastern waters. Both are categorized as critical facilities.

The Project is an improvement over current conditions because it will provide a continuous barrier resulting in a high level of coastal resiliency. Local streets will not be flooded, dewatering low lying areas will not be required, property will not be inaccessible for extended periods, and streets/infrastructure will not be damaged by inundation such as that which occurred in 2018.

General Site Description:

Little Beach is located along the southeastern coast of Chatham, Massachusetts. There are high density residential neighborhoods to the north and west, a boat marina to the south, and open ocean water to the east (Figures 1 and 2). The areas are bounded on the east by Chatham Harbor/Atlantic Ocean; to the west by State Harbor; to the south by Morris and Stage Islands; and to the north by various coves and embayments.

FEMA Designation:

FEMA Flood Insurance Rate Map (Community Panel No. 25001C0637J, dated 07/16/2014) shows the majority of the Project is located within Zone AE (elevation 13 ft), with portions of the Project located within Zone VE (elevation 13 ft) (Figures 3A and 3B).

State-listed Rare Species Habitat:

The most recent version of the *Massachusetts Natural Heritage Atlas* (14th Edition, August 1, 2017), shows portions of the Project falls within areas of *Estimated Habitat of Rare Wildlife and Certified Vernal Pools* and/or *Priority Habitat of Rare Species* designated by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) (Figure 4).

Scope of Work:

The scope includes measures that will create a continuous barrier to waves and water up to elevation 9 on the shoreline. Collectively, the barrier will be approximately 2,755 LF and consist of five connected components:

1. 640 LF of stabilized dune system to the southwest of the marina running parallel to the north-south leg of Edgewater Drive;
2. Replacement of an existing 135 ft long retaining wall with a higher wall (the "Hamill wall") at 65 Edgewater Drive;
3. Height extension along 840 LF of existing bulkhead at Outermost Harbor Marine and associated grading in parking lot;
4. Stabilizing an existing, 200 ft long dune constructed in 2018 in front of the Oceanfront Condominiums (the "Condo dune"); and
5. 940 LF of stabilized dune system northeast of the Condo dune along the beach from Starfish Lane northerly to the end of Windmill Lane.

Horsley Witten Group, Inc (HW) prepared plans for approximately 1,580 LF of dune stabilization to the northeast and southwest of OHM. Dune stabilization includes implementation of appropriate erosion controls, tree protection and limit of work demarcation; site preparation, grading, and construction; reinforcement with coir rolls; and aggressive stabilization with vegetation and sand fencing. Scope includes providing variable widths, slopes, and heights throughout the dune system to create a more natural system and avoid site constraints (roads, resource areas, etc.). An accessible path for clammers, residents, and vacationers to access the beach from the end of Starfish Lane will be provided. Existing private and other paths will remain and will be graded with moderate slopes under 10 to 1.

The existing dune in front of the Oceanfront Condominiums will be reinforced as needed to stand up to a three-foot wave and the attendant energy of the wave, as designed by Coastal Engineering.

Design for the marina bulkheads and Hamill wall at 65 Edgewater Drive has been completed by Fairbanks Engineering Corp. The Hamill retaining wall will be replaced with a similar wall 2-feet higher. The retaining wall will be reconstructed with appropriate measures on each end to connect to adjacent dunes.

To extend the height of the bulkhead at OHM, it is critical the lower portion of the existing wall be shored up with additional timber. To extend the height of the wall, excavation will have to be done on the landside of the wall first. In order to attach the extending timbers, it's necessary to extend them down along the wall also. Disturbance to the low section by digging a trench, back filling & compacting will require the lower section be made stronger than what exists. The work is divided into two phases:

Phase 1: Shore up the lower third of wall to help support the extension timbers.
The contractor will furnish all equipment, labor, and materials necessary to add support to the lower third of the bulkhead in 100 different sections between the pilings, the average section having seven (7) horizontal planks. The work entails placing 4 x 8 pressure threated timbers against the existing sheathing and vertical timber piles. They will be secured in place with wood wedges placed between the new timbers and the existing pilings. These wood wedges will be lag bolted to the new timbers to hold them in place

Phase 2: Add wall sheathing timber(s) to the existing bulkhead in order to raise the height. The marine contractor shall furnish all labor, equipment, and materials necessary to install 860 ft. of timber height extension to the existing wood bulkhead. The method of extending the existing bulkhead shall be based on a stamped, engineered plan designed by Transition Engineering Inc. of Middleboro Mass.

The work shall entail digging out 3+ feet of soil on the land side of the wall, attaching 3"x 8" sheathing lumber to the existing wall, secured with a horizontal whaler timber 6"x 6" fastened with galvanized thru bolts to the existing wall.

The sheathing wall shall be topped with 2"x 6" & 3"x 6" timber. There will be metal brackets placed approximately 16 ft. O.C. along the top of the wall, where diagonal bracing can be attached during the winter season. These braces shall be put in place and secured to concrete bases installed at grade level. All lumber shall be Pressure Treated Marine (splash) Grade ACQ.

Prior to the contractor arriving on site, OHM or their subcontractors, will prepare a staging area (principally for storage of sheeting and timbers. remove marina accessories such as the fuel station, electrical lines, junction boxes, outlets, and lighting and security cameras; a concrete slab (approx. 12 by 16) used to support the forklift when boats are being lifted out of the basin or lowered into the basin, and scraping up as much of the clam shell surface within 10 feet of the bulkhead within areas of dune connections. This work is itemized in the opinion of quantities and costs provided in Part D.

Consistency with approved FEMA plan

The proposed Project will block flood waters from entering the Little Beach neighborhood for water levels between elevation 4.9 and 8.5 to 9.0 NAVD88 by raising the elevation of the physical barriers to flood water incursion from the Atlantic Oceanside. Water currently overtops the dunes at multiple locations, comes up the marina boat ramp, and surcharges and backflows through several stormwater outlets in the marina parking lot. The proposed level exceeds storm levels previously experienced in this area by over one foot.

The Town's Hazard Mitigation Plan (HMP), 2018, identifies Morris Island Road and Little Beach Roads as having deficient infrastructure (culverts & low-lying roads). Additionally, Outermost Harbor Marine is listed as a Critical Facility (Table 3.4, page 107).
The Little Beach neighborhood is also identified in the HMP Mitigation Actions for Flooding, Storm Surge (#PP3, page 157) which reads as follows:

> Work with homeowners in the Morris Island/Little Beach area to reduce flood potential.
> Project Type: Property Protection
> Responsible Department(s): Natural Resources Dept., Community Development Dept., Dept. of Public Works
> Funding Source(s): Staff Time, Grant funding

Timeframe: 2-years
Consistency with Other Town Plans: Local Comprehensive Plan

Project Viability:

1) ***Project Scope:*** The Project scope adequately mitigates current flood hazard by increasing coastal defenses and resiliency along the Atlantic Ocean side of ***the stabilized sand dunes*** in the Little Beach neighborhood. Work includes raising the dune height from a low of 5.5 NAVD88 to a minimum of 9 NAVD88 north and south of the marina. The dune to the north of the marina (northeast dune) is approximately 940 feet long and the dune to the south of the marina (southwest dune) is approximately 640 feet long. The Project includes raising the ***bulkheads*** of the marina from approximately 6.0 NAVD88 to 9.0 NAVD88, providing a mechanism to block the boat ramp, and improving stormwater drainage infrastructure by installing one-way valves. The marina bulkheads are approximately 840 feet long.

2) ***Consistency with Planning:*** This application details how the proposed mitigation activity is consistent with the FEMA-approved Hazard Mitigation Plan (HMP) for the Town. The 2018 HMP Mitigation Action #PP3, recommends the Town "*work with homeowners in the Morris Island/Little Beach area to reduce flood potential*." The proposed mitigation activity is also consistent with the Town's Comprehensive Plan.

3) ***Co-Benefits and Transferability:*** The Project will improve resilience at, adjacent to, and beyond the Project site through key resilience factors such as elevated manmade structures and nature-based dune designs. Furthermore, the Project offers excellent transferability to other coastal communities. This Project can serve as a pilot project for other municipalities to learn from the techniques deployed and offers a replicable approach applicable in other locations across the state and nation. The proposed Project could work with a site's constraints including existing infrastructure (such as roads), wetland resource areas, and man-made structures such as houses. Site specific adaptations would need to be assessed and taken into consideration, but the basic project design, including native plants, slope, natural-dune design, pedestrian access, are readily transferable to other coastal areas where existing dunes need stabilization. A video recording each stage of the work will be made available to other municipalities and be broadcasted over the local cable T.V. station (Channel 18) providing the opportunity for other communities to view and learn from the Project.

4) ***Nature-based solutions:*** The Project promotes utilization of nature-based, green infrastructure design, which integrates climate change and coastal resiliency to:

- Reduce the loss of life, property, essential services, critical water-dependent facilities, and economic hardship before or after a natural disaster occurs;
- Reduce short- and long-term disaster recovery and reconstruction expenses;
- Increase cooperation and communication within community departments and among other stakeholders through the planning process;

- Re-establish the site's natural hydrology;
- Utilize existing (albeit reduced) natural shoreline defenses;
- Offers a cost-effective solution; and
- Increase potential for government funding for disaster recovery and reconstruction projects.

The bioengineered dune stabilization also provides environmental, aesthetic, and ecological benefits including:

- Protection against erosion and disruption of the long-shore sediment transport;
- Stabilizes the shoreline while reducing rates of shoreline erosion and storm damage;
- Improves coastal resilience and attenuation of wave energy and storm surge;
- Generates a long-term cost savings, as native local plants (used to stabilize the dune) better adapt to the local climate and require less water and maintenance;
- Enhances the area's natural capacity for potential adaptation to moderate amounts of sea level rise;
- Creates the opportunity for local ownership of the shoreline and management;
- Supports wildlife populations through restored and enhanced habitat and ecosystem function;
- Increases the capacity of the natural shoreline to withstand coastal flooding, wave impact, and erosion;
- Improves landscape in coastal areas and allows for more a natural and aesthetically pleasing appearance;
- Protects cultural, historical, and archaeological resources;
- Provides natural recreational opportunities such as fishing, boating, and birding; and
- The dune is designed to reduce wave impacts, mitigate storm surge, minimize erosion, improve slope stability, and improve coastal habitats;

5) ***Declared Event:*** This Project mitigates the type of hazard that occurred in a declared event (March 2-3, 2018) and is in the federally declared disaster area. (Declared Counties for 4372 & 4379 include Barnstable County, MA).

Repeat damages: If this Project is not implemented, there will be detrimental impacts, including loss of essential services, damage to critical facilities, infrastructure and buildings, and economic hardship. The 2018 flooding damaged homes, Outermost Harbor Marine, and flooded roads including Morris Island Road, which is the only road access to Morris Island, Stage Island and the Monomoy National Wildlife Refuge Headquarters. Seagull Road was also severely damaged by flooding in 2018. Vehicular access for emergency services was severely hindered by flooded roads. This required the use of boats to retrieve and remove stranded residents during the storm.

Public Involvement:

Residents organized the Little Beach Association, Inc. as a collective group to examine and recommend solutions to improve resiliency of the Little Beach neighborhood. This Project is the highest priority of the work to achieve higher resiliency and was formulated by the Little Beach Association, Inc. Multiple emails were sent to residents, and public meetings were held in May and September of 2018. Formal meetings were scheduled for presentation of materials to the Board of Selectmen in June. Ninety citizens petitioned the selectmen to help impacted property owners.

Socioeconomic and Other Considerations:

The proposed Project will maintain the character of the Little Beach neighborhood and its' social framework built of fishermen, shellfishermen (clammers), property owners, and renters. Due to ongoing morphological changes to the barrier beach and inlets, the topography of the barrier beach that previously protected the Little Beach neighborhood has drastically changed, rendering a higher tidal range and an upsurge in wave energy. As waves and storm surge cut into low-lying areas and dunes, shorelines wash away and sea waters flood the land rendering roads, shoreline, homes and the marina inaccessible and allowing erosion to make its' mark. Destructive as this flooding may be, it has brought the diverse Little Beach community together to find a beneficial solution for all.

The Little Beach Association, Inc. (LBA) and its consultants are available to collaborate with the Town's Department of Natural Resources to administer a grant for stabilizing dunes, which will mimic natural dunes common on Cape Cod. The construction will occur on the upland side of the normal high-water mark and the planted vegetation will be similar to what exists on natural dunes. Our goal is to avoid long-term effects and minimize impacts on coastal resources.

The Project will not result in any permanent negative environmental impacts identified during the preparation of this application. It is also not a project with political influences or impacts.

Project Budget:

The total estimated Project cost is $2,469,009 and summarized in Exhibit D – Project Cost Estimate Worksheet and detailed in Opinion of Cost (attached). This includes a 5% contingency to account for unforeseen variables such as additional permitting, material price increases or unexpected field conditions.

The LBA is committing (Exhibit L) to seeking funds and grant options to meet the estimated project cost. LBA donated $4,600 to the Town towards the cost of MEMA HMGP application process including BCA toolkit analysis. Horsley Witten Group, Inc. (HW) was hired to permit and design the northeast and southwest dunes. The cost of the professional services provided by HW ($19,750) can be considered as match-in-hand. Additional funding sources will be pursued to cover the cost of the project, including a 25% non-federal match.

Pros and Cons of the of the Proposal:

The pros include that the stabilized dunes will be naturalized into the beach environs and that the marina can remain in service. Cons are that the marina bulkheads cannot be raised higher with an attendant upward elevation of the dunes. Cons of the dunes include that it is very difficult to reinforce a small dune and, without proper stabilization and reinforcement, portions of the dune system may fail in the future. In addition, the defenses which will be provided, are not intended to protect homes to the 100-year base flood elevation of 13.0 NAVD88. To protect against the 100-year storm, individual owners will need to raise their homes. In a sign of support for the character of the Little Beach neighborhood, nine homes have or are in the process of permitting to raise the structures so the first-floor elevation is at 14.0 NAVD88.

Level of Protection:

The Center for Coastal Studies issued a 2018 report on storm inundation pathways in the Little Beach area. The report concludes "*The land in and around Outermost Harbor is a flat, low-lying area made more vulnerable to inundation with formation of the new inlet on April 1, 2017. Many storm-tide pathways are in this area, and as evidenced by the January and March 2018 storms, they are among the lowest pathways that can convey storm tide water to much of the Little Beach area.*" "*…it appears that focusing on the general area proximate to Outermost Harbor Marine would reduce the more frequent flooding of the Little Beach area associated with the more frequent, less powerful coastal storm tide events (<6 ft NAVD88).*"

Recommendations of this study include "*Recognizing that addressing storm tide pathways with elevations exceeding 8.0 ft. NAVD88 present significant design challenges…" ; "therefore, in the short term, the following actions be explored to minimize associated flooding:*"

1. "*Address the low-lying storm tide pathways in areas proximate to Outermost Harbor Marine.*
2. *Address the storm tide pathway low-lying areas at the end of Starfish Lane."*

For the analysis of level of protection, both dynamic conditions and still water conditions were evaluated. As the barrier beach shifts along the coast the worst conditions occur when there is a breach in the barrier beach such as what currently exists.

The level of protection, provided by elevation 9.0 ft NAVD88, was assessed using two methods with information from the 2014 FEMA study. Interpolation results in a conclusion that the dune will provide protection up to a base flood with a recurrence interval of about 50 years.

The complexities of the beach dynamics make the level of protection an approximate value only. It is safe to say, level of protection will increase as the barrier beach (North Beach) shifts and migrates to the south to better protect Little Beach from wave energy.

According to FEMA's Flood Insurance Study (FIS) for Barnstable County (07/16/2014), still-water elevations (SWL) in the area of Little Beach (transects 111 and 112) (Figure from the FIS is attached) are as follows:

Table 1. Stillwater elevations at Transect locations for various return period storms (NAVD88).

Transect	10-yr (10%)	50-yr (2%)	100-yr (1%)	500-yr (0.2%)
111	5.1	7.6	9.1	12.3
112	5.1	7.6	9.3	13.6

Table 2. Estimated BFE at dune in FEMA floodzone AE (el 13 ft); assuming 3-ft wave height.

Storm	Stillwater Elev (ft)	Wave Height (ft)	Top of Wave Crest Elev (ft)	Base Flood Elev (BFE)
500-yr (0.2%)	13	3	15.1	15.1
100-yr (1%)	9.1	3	11.2	11.2
50-yr (2%)	7.6	3	9.7	9.7
10-yr (10%)	5.1	3	7.2	7.2

Top of wave crest elevation is estimated assuming 70% of the wave height is above the SWL (FEMA direction).

Based on the above analysis it appears a dune constructed to elevation 9 feet (NAVD88) would provide protection up to the 50-year (2%) return storm. Interpolation would yield a return frequency of about 40 years with Little Beach most susceptible when the outer barrier beach is compromised. Portions of the dunes are insufficient in size to provide sand volume adequate to provide protection of the dune up to elevation 9.0. Instead, the dune must be reinforced to the strength and velocity of a 3-foot wave. LBA retained Horsley Witten to provide this design.

As the northerly barrier beach shifts in a southerly direction, Little Beach will be better protected. However, the timing and ultimate affect cannot be determined with certainty at this time.

Maps, resource references, and computations are provided as attachments to this application.

Anecdotally, people who have lived in the neighborhood have not seen this type of flood activity over the past 25 years. The change in the barrier beach creates a rapidly changing dynamic that has not been fully quantified. The Town of Chatham is conducting a coastal resiliency study along the Town's eastern shoreline. The projects included in this application will compliment further recommended measures that may result from the Town's study.

Hydraulic Impacts:

The watersheds for the southerly side of Little Beach have been delineated and analyzed for this Project to identify potential impacts on hydraulics and hydrology. These subareas and related information are shown on the maps which accompany this section.

The first subarea includes the southern end of Seagull Road beyond the marina and Edgewater Drive. This subarea and others are divided into an "A" segment reflecting the break on the dunes where runoff would drain to the harbor. This subarea includes two homes on Seagull

Road and one on Edgewater that have sunken foundations that also function as garages. Water can drain to these from adjacent areas, but the respective catchments are small. Runoff from most of the subarea is directed to one of three areas. There are two depressions on the west side of Seagull where the collected water collects and is infiltrated at a rapid rate. Standing water in these three areas is rare, reflecting the high infiltration capacity. The third area is a depression area between Edgewater and Seagull roads where runoff accumulates. This area has a lower infiltration rate and seawater during major storms often fill this depression area, overflow, and travel down Seagull Road to the first infiltration area on the northwesterly side of Seagull Road. The only area that does not drain to one of these three depressions is the southeasterly side of Edgewater Drive. Runoff currently flows to a small depression in the dunes or across the dunes toward the Harbor with most runoff infiltrated within the dune, or down Edgewater Drive to the harbor.

Construction of this Project will block floodwater from travelling across the dunes from the south side of Edgewater Drive. This is the only area of the Project where the crest of the dune is altered. Instead of being in the center of the road, it will shift approximately 20 feet off the edge of the road. Runoff will either infiltrate or run along the edge of the shoulder to an existing or proposed depressional area along the edge of the road or continue to flow to the toe of the landward dune slope at the terminus of Edgewater Drive. Although the runoff volume is low, the consultants have designed an inlet and filter to collect any excess water and avoid direct discharge to the harbor. Consequently, any negative drainage impacts from the Project will be mitigated.

The second subarea surrounds the marina. Water enters the marina area from the southeasterly side of the yard at the rear of the condominiums and the back of other adjacent properties. Most of the water from the condominiums is infiltrated to the droughty soils at the back of the condominiums or infiltrated through the porous crushed shell surface of the marina. Runoff within the marina property is typically only seen from the roof and bituminous concrete pavements since the other areas are crushed shells and quite permeable except for roof and pavement areas. The runoff from these hard surface areas is directed to one of five inlets on the northeasterly edge of the marina bulkhead where it is discharged to the marina basin through piped connections. Backwater valves will be installed on these two inlets to prevent backflow and flooding from major storm events.

The two dune extensions between the marina bulkheads and the dunes will have small areas where runoff could collect. Excess crushed stone will be placed on the landside of these extensions to allow any runoff to infiltrate.

The third subarea is a small area behind the Oceanfront Condominiums where roof and other runoff is accumulated and infiltrated or drained into the foundation drainage system. The extreme end of the subarea drains to the dunes where it infiltrates or enters the Harbor. This area is not impacted by this Project.

The fourth subarea receives the runoff from the side streets and 18 cottages (except the rear of the units of Lobster Lane and Scallop Terrace near the subarea boundary), the front of the

condominiums and half the rooftop, and its parking area, the attendant portion of Seagull Lane within the catchment, and the ball field where water accumulates in a large depressional area. The base elevation in this depressional area is at elevation 2 compared to elevation 9 for the crest of dunes for this Project. The Oceanside section of this subarea (subarea 4A) drains to the dunes. The proposed dune will be centered near the current ridge of the dune system allowing current flow regimes to be maintained. The changes in the dune area are not expected to significantly impact the infiltration of the small amount of runoff that could occur in the dunes. Instead, any runoff would be trapped with low spots until it quickly dissipates.

The fifth subarea is a small, principally wooded area where runoff collects on the forest floor and infiltrates. The Project does not impact this subarea.

The sixth subarea contains the salt marsh between the dunes and Seagull Road. This marsh seems to be a result of very tight soils since the tributary area is quite small. It is expected that subsurface drainage from adjacent areas beyond the subarea boundary also help maintain the water levels within salt marsh. The salt marsh is seldom dry. Near the dunes the drainage is divided on the crest with runoff flowing toward the salt marsh or to depressed spots in the dunes. The Project will not significantly impact the drainage regimes of this catchment, since the dune ridge will remain in approximately the same location. Area 6A shows the runoff from the crest of the dunes to the ocean with much of it anticipated to be infiltrated before it becomes concentrated flow.

Subarea 7 contains properties that drain to depressions behind the homes where the water infiltrated. There is a ridge in the dunes with some runoff directed to the depressions with other draining down the dune with infiltration as the water flows or continuing to the tidal flats. This subarea also includes an "A" component similar to other areas where water can flow from the dune ridge to the ocean. Again, the dune crest will remain essentially unchanged. During the review of the drainage regimes, it was discovered that one of the dune depressions in catchment 7A was being filled. The grading is (was) modified to avoid filling this area and altering the infiltration and potential runoff patters within the dune. Consequently, the crest of the dune will be essentially the same and depressional infiltration areas within the dune will be maintained.

In conclusion, the Project hydrology and hydraulics have been reviewed. Most times the drainage regime is unchanged since the crest of the stabilized dune will essentially be located at the current location. However, the dune will be shifted in catchment 1 with runoff directed along the southwesterly side of the shoulder of Edgewater Drive, instead of flowing directly into the dune or continuing to the harbor. To mitigate this impact a sand filter will be constructed at the terminus of Edgewater Drive to collect any runoff and avoid concentrated flow from crossing the dune.

The changes will be minimal since the dune ridge, which divides surface runoff flow (if any) between the Little Beach neighborhood and Chatham Harbor, will not undergo any major changes. Figures B-1, B-2, and B-3 show the current and proposed dune ridge and the proposed dune ridge to demonstrate there will not be substantive changes to the ridgeline thereby supporting the information presented herein. Little Beach Association does not believe the

Project will impact upstream or downstream flows.

Activities Description:

Project Area: The Project is linear in nature with sand dunes being raised along approximately 1,580 feet of shoreline on either side of the marina and Oceanfront Condominiums and about 850 feet of bulkheads along the marina. The area includes a footprint of approximately 28,600 square feet of dunes and 2,550 square feet inside the marina (based upon average widths of 22 feet and 3 feet respectively). The total area is, therefore, about 31,150 square feet.

The impacted area of the Little Beach neighborhoods, which will benefit from the higher resiliency, is an area of approximately 27 acres.

Dune Stabilization Project – Basis of Design

The proposed Project area is shown on FIRMette Map 25001C0637J and further described by the 2014 FEMA Flood Insurance Study (FIS) with site specific transect information numbered 111 and 112. The proposed Project area is located within FEMA AE and VE flood zones designated at elevations 13.0' and 15.0' (NAVD88) respectively. A majority (approximately 60%) of the proposed Project site is within the AE13 flood zone. Anticipated wave heights within AE13 are indicated as less than 3 feet.

The design intent proposes gentle slopes, core and toe protection, with native plants planted to provide stabilization. A minimum crest elevation of the proposed dune system is designed at elevation 9.0 feet with a minimum width of 6 feet and is to exceed these minimums where spatial constraints are less prohibitive. The vertical elevation of the dune was restricted by the lowest proposed elevation for the adjacent marina bulkhead work. The design storm analyzed during design development was 50-year (2% return interval) used to establish a stillwater elevation of 7.6 feet and calculated with a wave height of 3 feet to determine a base flood elevation (BFE) at 9.7 feet.

Due to existing site conditions and features (e.g., bulkheads, walls, littoral zone vegetation, hind dune vegetation, private dwellings, roadways, and public beach access), the proposed limit of work and vertical elevations aim to tie into existing walls and existing landforms exceeding the minimum dune crest elevation (9 NAVD88) when possible. Resource areas were flagged in the field by a wetland biologist and slope gradients were carefully considered to protect significant vegetation both seaward and landward. The design will also maintain accessible pedestrian routes to traverse the dune system during and after construction.

The design of the dune also considered aesthetics by mimicking a natural dune shape, as opposed to a geometric berm concept, as well as minimization of disturbance to existing resource areas and vegetation and infrastructure.

The foredune slopes are set with a minimum horizonal distance of 6 feet for every 1 foot of vertical rise, referred to as a 6:1 slope. In areas which are less restrictive due to existing features and environmental constraints, the foredune slopes will exceed the minimum up to 9:1.

Biodegradable coir will be entrenched into the existing substrate within the dune system serving as both toe and core protection in the event of storm surge hitting the system during plant establishment. All coir fiber rolls will be filled with coarse sand, woven together, and anchored using bright steel duckbills.

The amount of sand added will depend on the height of the existing dune. The goal is to obtain a height of 9 feet (NAVD88) within the extent of the project limit of work. Dune habitat will be created with sand sourced from Outer Harbor Marine (OHM) dredging project (not part of this proposed project) and supplemented as necessary from upland sources with sediments compatible with existing aeolian sands at Little Beach.

The entire dune system will be top dressed with washed, coarse sand and planted using native, salt tolerant plant species found locally within coastal communities in Massachusetts. The primary species being proposed is *Ammophila breviligulata*, commonly known as American Beach Grass. Subsidiary plants for dune stabilization may include seaside goldenrod (*Solidago sempervirens)*, beach vetchling *(Lathyrus japonicus)*, New England American-aster *(Symphyotrichum novae-angliae)*, switch panicgrass *(Panicum virgatum)*, little bluestem *(Schizachyrium scoparium)*, Virginia creeper (*Parthenocissus quinquefolia)*, small bayberry *(Morella caroliniensis)*, beach plum *(Prunus maritima)*, and Virginia rose *(Rosa virginiana)*.

Construction Sequence:

The construction sequence for the dunes - to be used as a general guideline:

1. Survey and stake the proposed limit of disturbance, limit of erosion controls, install temporary construction fencing, and establish tree protection as indicated on drawings.
2. Place all erosion controls as indicated on drawings and staked out in the field. Under no circumstances is the limit of work to extend beyond what is indicated on drawings.
3. Begin clearing the site as required. Contractor to coordinate with the wetland biologist and/or landscape architect to determine all vegetation within the limit of work that shall be transplanted and reused for restoration. Heel in all transplanted vegetation upland of the project area in a cool, shady location. Water daily during drought conditions.
4. Rough grade all areas disturbed during site clearing.
5. Deliver sand/fill material to the site. Store all imported materials in the designated stockpile areas as indicated on the drawings.
6. Layout Coir fabric in the proposed locations for both core and toe protection as shown on the drawings. Prior to filling and sewing the coir fabric, confirm alignment and placement with owner or client representative.
7. Upon approval, excavate and entrench the coir fabric in place to depths indicated on the drawings. Tightly sew one end of and sides of fabric together using jute rope to fromr the coir rolls/envelopes. Leave one end open and fill coir rolls with coarse sand and gravel mixture, see specifications. Adequately fill each coir roll until fabric does not slump.

Tightly sew together open end and secure the coir roll in place with anchoring system as shown on the drawings. Ensure coir rolls overlap as indicated on the drawings.

8. Bring rough grades to conforming elevations as soon as practicable. Contractor to coordinate work to minimize time soils are un-stabilized.
9. Permanently plant all disturbed areas within the limit of work as indicated on drawings. Reuse transplanted vegetation where possible. Contractor to coordinate with wetland biologist and/or landscape architect.
10. Install sand fencing, signage, and all other control practices as indicated on the drawings to protect the newly restored areas.
11. Contractor is to coordinate with owner(s), engineers, and landscape architects to confirm substantial completion. Upon approval, the contractor is authorized to remove all temporary erosion control measures, demobilize equipment, and must restore all disturbed areas as a result of the construction process back to its original state to the greatest extent practicable.
12. Extended plant care beyond the one-year warranty period and overall system monitoring is highly recommended to ensure healthy establishment and adequate vegetative coverage.

The construction sequence for work at the marina will be as follows:

Preparation at the marina before OHM contractor arrives (to be conducted by marina personnel with assistance of electrician).

1. Complete permitting and designs
2. Prepare space in marina yard to stockpile materials for contractor
3. Remove fueling station and connections to fuel and electrical systems
4. Remove electrical conduits and conductor from along the inside face of the bulkheads
5. Remove electrical conduits and conductor from along the parking lot face of the bulkheads
6. Remove Concrete Slab for Forklift (14’ by 20’)
7. Remove berth water supply, hose bibs, and hose racks
8. Remove marina map bulletin boards
9. Remove and stockpile parking directional signs
10. Removed flagpole (Conditions may warrant replacement)

Bulkhead Revisions

1. Remove shells from work area
2. Excavate necessary material from behind the wall to a depth of approximately 3” ft
3. Install approximately 7’-8’ long 3”x 8” tongue and grove timber to the existing wall
4. The sheathing timbers shall be fastened the existing bulkhead with galvanized thru bolts to the existing upper-most whaler
5. At the top of the 3 x 8 sheathing there shall be a 2 x 6 timber running horizontally along the wall with 3 x 6 cap timber
6. At approximately 16 ft. O.C. there will be metal brackets fastened to accept diagonal seasonal bracing

7. Diagonal bracing, designed to add strength to the wall shall be put in place by others during the winter months
8. Concrete support bases shall be put in place below grade level
9. The wall will be back filled with the same sand and shell material that was removed at the start of the project. If necessary, a base of gravel and new shells will be provided at the top of the trench section
10. Rebuild marine fuel station
11. At all four ramp locations, gas dock & lift area there will be bulkhead wall built and fastened with metal bracket(s)
12. Reinstall electrical conduits, conductors, water supply to berths, hose bibs and hose racks, signs and appurtenances, and marina service outlets
13. Final Inspections and cleanup
14. Resume normal operations

The portions of the Project including the Hamill wall, the connections to the OHM, and additional stabilizations to the Condo dune are in earlier stages of development and design and therefore do not yet have construction sequences.

Project Staff:

The staff for the dune stabilization portions of the Project will include the following:

- Construction phase services performed by the Engineers of Record
- Town representatives
- Little Beach representatives
- Construction crews typical for dune stabilization
- Surveyors, Superintendent and Foreman
- Truck drivers
- Front End Loader operators (at source of material and at the beach)
- Small equipment with operators to spread the sand, shape the dunes, and place the cover materials
- Small equipment with operators to move the mesh and erosion control materials
- Laborers with small hand operated equipment to install the mesh, anchor staples, and planting material

Construction Crews for the Bulkhead and OHM related work

The work to reconstruct the Hamill Wall and to raise the marina bulkhead is anticipated to require the following personnel:

- Superintendent
- Foreman with surveying capability
- Personnel from the marina to offload materials with a large forklift they have on site and to coordinate activities at the marina site
- An electrician and assistant to remove and replace conduits, conductors and convenience outlet

- A special mechanical subcontractor (2 people) to disconnect, remove and reset the fuel dispensing facility
- A plumber to disconnect, reconnect or replace the water service to each pair of slips inside of the marina basin
- A site contractor with jackhammers, a large excavator, trucks, a front-end loader, and small backhoe with the appropriate operators and laborers
- A pile driver with operator
- Personnel for forming and placing concrete for new tiebacks and to replace the boat landing platform and a driver to operate the concrete truck
- A small dozer with operator
- 4 carpenters and 4 laborers

Once the materials for the marine contractor have been received, the Marine contractor will arrive on the site.

Following the work of the marine contractor a general site contractor will arrive to construct the dune section between the Outermost Harbor Marine's bulkhead and the dune in front of the Oceanfront Condominiums and between the marina bulkhead and the Hamill retaining wall on the adjacent property to the south. It is anticipated that the work to raise the Hamill Retaining wall will be completed prior to the dune work in order to simultaneously accommodate the regrading and site work on the Hamill parcel.

Deliverables:

Year-1, Objective-1: Raising OHM Defenses
Combined with the proper operation of a muscle wall at the marina ramp and raising of the bulkheads to an elevation of 8.5 – 9 NAVD88

Year-1, Objective-2: Dune Defenses Southwest of the OHM
Construct a vegetated dune from the area southwest of the marina running parallel to Edgewater Drive to an elevation of 8.5 – 9 NAVD88

Year-1, Objective-3: Administration of Year-1 Activities
Collect completed documentation, including reports; grantee meetings; final inspections; record drawing data; post construction surveys; easement documents for all affected properties; draft a plan for 6-month and special event monitoring.

Year-2, Objective-1: Dune Defenses Northeast of Oceanfront Condominiums
Construct a vegetated dune between the Oceanfront Condominiums and the northeast end of the properties along Windmill Drive to an elevation of 8.5 – 9 NAVD88.

Year-2, Objective-2: Administration of Year-2 Activities
Collect completed documentation, including reports; grantee meetings; final inspections; record drawing data; post construction surveys; easement documents for all affected properties; draft a plan for 6-month and special event monitoring.

It is anticipated that the construction contracts will use AIA documents supplemented with special conditions which pertain to the grant. Key personnel will be provided with a copy of the specific requirements of MEMA for the Project. The administration will include oversight of the construction documents as well as the MEMA grant, which the Town and the consultants for Little Beach Association, Inc. (Horsley Witten, Coastal Engineering, and Fairbanks Engineering Corporation) are familiar.

Key Milestone Activities

Year-1, Objective-1: Raising OHM Defenses

- Press Conference and mailings to inform the residents of project implementation
- Prepare and Release Request for competitive contractor construction proposals
- Relocate some boats and property from the marina off-site to establish work and staging activities
- Award Construction Contract
- Preconstruction conference
- Order sheathing and other materials with delivery to and offloading by the marina
- Prepare staging area for the marine contractor
- Remove materials around the marina bulkhead including the fuel supply system, electrical services, potable water piping and accessories for the berths, lighting, signage, and the concrete slab.
- Excavate and install new sheathing, wales and tie backs.
- Pour concrete to secure tiebacks
- Backfill
- Raise the bulkhead structures
- Replace the seawall in front of 65 Edgewater drive
- Install sheathing for transitions at and between the bulkheads, retaining walls, and condominium dunes
- Regrade the site and restoration or replacement of the fuel station and appurtenances around the marina
- Restoration
- Final Inspections, punch list prep. and surveys
- Address punch list
- Administrative services will be provided throughout the construction project and as required to administer the grant
- Begin raising the bulkheads
- Contract connections to adjacent shoreline defenses on adjacent property
- Restoration as needed
- Final inspections
- Administrative activities to support

Year-1, Objective-2: Dune Defenses Southwest of the OHM

- Prepare and solicit requests for the competitive construction proposals

- Evaluate bids, select contractor and award contract
- Preconstruction conference
- Prepare erosion control measures necessary to implement planting
- Dune preparation; including salvage of significant plantings
- Construct dune to conform to the locations, cross sections and contract documents
- Provide soil/mulch cover
- Install protective erosion control matting
- Plant new native dune sprigs
- Monitor the establishment of vegetation
- Final inspection

Year-2, Objective-1: Dune Defenses Northeast of Oceanfront Condominiums

- Prepare and solicit requests for the competitive construction proposals
- Evaluate bids, select contractor and award contract
- Preconstruction conference
- Prepare erosion control measures necessary to implement planting
- Dune preparation; including salvage of significant plantings
- Construct dune to conform to the locations, cross sections and contract documents
- Provide soil/mulch cover
- Install protective erosion control matting
- Plant new native dune sprigs
- Monitor the establishment of vegetation
- Final inspection

Exhibit B-4: Alternatives:

The alternatives considered methods to increase coastal resiliency and protect the area from elevated storm water levels.

Alternatives for the OHM

The premise of the alternatives is that raising the bulkheads to elevation 9.0 ft NAVD88 is the maximum elevation to which the marina can operate with essentially the same building and configurations. Alternatives to raise the bulkhead above this level would entail raising the marina site, building and approach road, retaining walls around the perimeter of the site to hold the fill and would be a multimillion-dollar project that is not considered to be viable in the Little Beach area. Five alternatives for raising the timber bulkheads from elevation 6 ft to 9 ft are presented below.

Alternate-1

The proposed Muscle Wall system is a proprietary plastic extension wall to be installed on top of the existing timber bulkhead. This alternate is proposed by Transition Engineering, Inc and included a stamped engineered plan dated 11-2-18. The material cost for this system is $53,250 as provided by Muscle Wall to address 840 linear feet (LF) of existing seawall. The Muscle Wall

is attached to the bulkhead using a proprietary clip system that connects to 2' x 6' timbers using (2) 5-inch (in) Ledgerlok Screws that attach to the bulkhead timber sheeting. This approach would only increase the existing seawall height 2'-4" which is less than the 3 ft required to achieve a new top of wall elevation of 9 ft. Installation of the muscle wall, including strengthening the existing bulkhead is estimated to cost $610,000.

This system could be damaged during large storm events. Wave and hydrostatic imbalance forces on the Muscle Wall extension will result in large lateral and moment forces. Our concern is not the structural integrity of the Muscle Wall system but the connection to, and stresses induced in, the timber seawall. Damage to the timber seawall could occur after large storm events and may require significant maintenance. The connection shall be designed by a Professional Engineer to determine if it can handle the large forces anticipated. This design shall include an analysis of the effects of the Muscle Wall on the existing seawall and construction shall include any strengthening/reinforcing required.

Alternate-2

This alternate would be to construct a new vinyl bulkhead on the waterside of the marina basin. This would narrow the marina basin by about 3-5 feet. This approach was undertaken several years ago when the bulkhead was replaced resulting in a marina basin width that has already been narrowed. The installation of a new bulkhead would narrow the marina basin to about 98 feet increasing difficulty of navigation within an already narrow basin. The cost for this alternate is estimated to cost $1,586,000.

A new sheet pile seawall is anticipated to be a viable alternate. A new anchor system would be required given the seawall height is being raised. The new seawall system would need to be designed by a professional engineer. The downside of this approach is that the marina would lose between 3 and 5 ft in width (possibly more) to accommodate the new sheet piles and wale system.

Alternate-3

This alternate includes excavation of the backside of the bulkheads, installing a new wale and timbers to strengthen the bulkhead. A timber frame would be added and secured to the existing bulkhead to raise the height by three feet. This alternate would also require rerouting electrical cables and conduits, placing new surface material over areas that were excavated and backfilled for the work, adding some new water barrier and caulking, removing and replacing the gas and ramp sections and misc. work. The cost for the marine contractor's work is estimated to be in the range of $430,000. Preparation, removals, and replacements add $86,000 for a total cost of $516,000. Fairbanks Engineering Corporation believes the scope and extent of the work is understated and believes the structural needs and costs will be considerably higher. The contractor's price was doubled in order to cover the anticipated increase in construction work required.

The initial construction would include adding seven (7) horizontal 4 x 8 pressure treated timbers against the existing timber sheeting; 100 sections are anticipated to be required to strengthen the entire seawall. The proposal is unclear about what elevations these timbers would be installed

only that they are located at the lower 1/3rd of the timber seawall. The new timbers would be wedged against the timber fender piles and lag bolted in these areas.

The second phase of work would include adding new timber sheeting attached to the back of the existing seawall to extend the height 3 ft to elevation 9 ft. This would require excavating about 3 ft behind the existing seawall to allow for the new timber connection. The new 3 x 8 timber sheet extension would be attached to a new 6 x 6 wale and the existing sheets using galvanized hardware. The top of the extension timber would be capped using 2 x 6 and 3 x 6 timber. The extension structure must be supported by the IMS addition of diagonal braces every 16 ft. This is assumed to be required because the system cannot handle the lateral forces caused by wave and hydrostatic imbalance forces. These would need to be installed by the Owner in advance of any storms. The braces are supported by concrete bases; the detail of these concrete bases was not provided.

At this time there is no engineering for this approach, but the vendor indicates this would be designed by a professional engineer as part of their proposal. We do have some concerns based on the descriptions provided. The addition of the lower reinforcement appears to be resisted by the fender piles. This will add lateral load and bending to these piles which must be analyzed. It would also increase the load on the tie rod and Deadman anchor system for the seawall that must be analyzed. The concrete support bases for the diagonal braces are unclear and may be subjected to erosion during coastal storm events that cause wave overtopping. If these bases are undermined it is assumed the timber extensions could fail and/or deflect excessively causing damage to the timber seawall. These items would need to be addressed in design and may likely add costs.

Alternate-4

This alternate would be a hybrid vinyl system described by Land and Sea (one of the potential vendors) as a front facing of vinyl sheets with new strength provided by a cementitious slurry that would be placed between the existing timber sheets and the vinyl fascia.

This was proposed by Beacon Marine Construction and includes a cost of between $1200 and $1,600 per foot of new seawall depending on whether the existing anchor system can be reused of needs to be replaced. The new sheet piles would extend to elevation 9 ft to provide the additional protection required.

The new vinyl sheets would extend only a few inches below the mudline. It's unknown at this time if new wales would be installed or if the new sheets would be attached to the timber sheets to increase strength. A cementitious slurry would be poured in between the existing bulkhead and the vinyl sheets. The intent of the cement fill is reportedly to increase the strength of the seawall (assumed to resist bending stresses in the lower section of the seawall). The new vinyl sheets would extend to elevation 9 ft to provide the protection required. A new concrete cap would be constructed at the top of the new vinyl sheets.

Currently there is no engineering or plans for this approach. The system would need to be designed by a professional engineer. However, we do have some comments and concerns with

the approach concept. A cementitious slurry is proposed between a new and existing bulkhead structure, we assume, to strengthen the existing seawall to resist larger bending stresses caused by the raising the seawall height. The new sheets only extend a few inches below the mudline which is not extend deep enough to reinforce the existing seawall at the location of the maximum bending stress which would occur many feet below the mudline. This detail would need to be addressed. The concrete infill between the new and old sheets is believed to be intended to provide reinforcing for the bending stress. Unreinforced concrete would not provide much strength increase because bending would cause cracking of the concrete; as such and the addition of steel reinforcing would be recommended. It may be better to design the new vinyl sheets to resist the increased load and bending stress.

The use of cement fill between the old and new sheets will also prevent water from draining through the bulkhead system creating an increase of hydrostatic pressures on the back side of the wall that may increase loads on the seawall's anchor system (tie rod and Deadman). The tidal fluctuations in Chatham are approximately 5 ft; therefore, installation of non free draining material between the two walls could result in 5 ft, or more, of hydrostatic pressures that would need to be accounted for during design; this imbalance could be even higher during an extreme moon tide or immediately after a major coastal storm. If a new vinyl wall system is installed seaward of the existing wall system, it may result in lower forces on the structure if the gap between the walls is filled with free draining material. The lower 2 ft+- within the space between the old and new sheets could be filled with grout if there is a concern about the crushed stone being lost out the bottom of the new sheets. The new hybrid seawall system should also be designed by a Professional IMS Engineer for the full loading from the soil, surcharge loading, hydrostatic pressures, and wave action as appropriate.

This approach would also encroach on the marina basin space. There would be some loss of basin width, but it's not anticipated to be as much as the new vinyl wall alternate discussed above. However, the basin area is already tight, and this impact must be considered.

<u>Alternate-5</u>

As an additional design option, we recommend looking at extending the top of the existing wall up to elevation 9.0 ft by attaching timber or vinyl sheets to the back of the existing seawall. The intent would be to excavate behind the seawall to the level of the lower wale. The extension members (timber or vinyl) would be bolted to the upper and lower wales (and possibly to timber added to the top of the seawall). The addition of the system would increase moments in the sheets and forces on the anchor system of the existing seawall that would need to be addressed. We are proposing to install a new concrete Deadman system behind the wall. Also, the upper tie rods would be replaced, and second level of tie rods would be added to connect to the lower wall. This will reduce the moment in the sheets. The new Deadman is proposed to be a cast in place or precast concrete block system buried below grade several feet and located a sufficient distance behind the seawall to ensure the active zone behind the seawall and the passive zone in front of the Deadman do not overlap; based on some preliminary assumptions this is about 25 ft behind the bulkhead; the Deadman construction impact on adjacent property lines and the street may also need to be addressed.

This alternate has not been engineered and would need to be analyzed as part of an alternate's investigation to ensure it can handle the forces resulting from wave action at the site. The extension of the top of the wall by 3 ft could require reinforcement of the existing timber wall system including possibly increasing the strength of the wales. Also, the new tie rods will need to be offset from the existing tie rods and timber pile Deadman system to ensure they can be properly installed. Installation of the new Deadman system is expected to require excavation to around mean low water (MLW) to place the concrete. Dewatering and/or working with the tidal schedule will likely be required to complete this work.

We understand that engineering and construction costs have been provided for the Muscle Wall and Vinyl Wall alternates. For the alternate to Extend the Existing Timber Wall we recommend budgeting $50,000 for the engineering and $1,000,000 for the construction. This construction estimate is not based on engineered design at this time and should be expected to change.

Alternate-6

This alternate would be to annually erect and remove a muscle wall system sitting around the entire bulkhead. This is anticipated to cost in the order of $170,000 for material plus annual setup and removal, which is a significant amount of work. This amount of work was not practicable due to the time and labor involved and the conflicting demand for marina personnel when a storm event approached. Using a rule of thumb for construction cost being 2.5 times material costs, the cost (again excluding annual setup charges would be in the order of $425,000. In addition, such a system would leave the entire Little Beach area exposed in the event of a late summer hurricane or other inclement weather periods when the temporary system was not in place. This is not considered a safe/reliable system and is not recommended.

Alternate-7

Little Beach Association, Inc. considered a concrete retaining wall around the perimeter of the marina lot with a waterproof coating. The approximated cost for this option would be in the order of $800,000, require a movable barrier at the entrance, which is considered unreliable, and would impact views from adjacent properties, and really isolate the marina from the Little Beach neighborhood. Opposition would be expected to be substantial since all the abutters would look at a concrete wall. This system would not protect the marina site and is, therefore, not recommended.

Conclusion

Upon review of the alternatives, the recommended alternates include 2, 3, 4 and 5. These alternatives should be carried into formal evaluation and a sum of $965,000 be included in the budget provided with the application. The options all require that two existing catch basins in the marina yard be equipped with backflow preventers since the rim elevations are below elevation 5.0 ft NAVD88. All the options require site work to retain as much parking as necessary. The dune connections are an additional cost not included in the numbers presented above.

A letter from Bob Fairbanks discussing the alternatives is included in the appended materials to this section labeled "Evaluations by Fairbanks Engineering, a letter summary, cost information

submitted to the marina, a sample suggestion for dune reinforcing from another FEC project and information on industrial sandbag dimensions".

Alternatives for the Hamill Retaining Wall

Alternate-1
The Hamill seawall is a plastic "Z" sheet system with a top of wall at elevation 7-foot. This wall is reportedly tied back using helical anchors based on the plans provided. Reportedly there is also toe protection installed at the seaward side of the seawall in the form of 4 layers of coir mats.

In order to raise the Hamill seawall by approximately 2 feet, we recommend installation of a new vinyl sheet pile wall seaward of the existing wall. The gap between the two walls should be filled with free draining material. The new wall should be designed to assume that the existing vinyl wall is not in place, resulting in the new wall being designed for the full loading from the soil, surcharge locating, hydrostatic pressures, and wave action. The new wall will likely require installation of a new anchoring system. We recommend the use of a concrete Deadman and tie rod system or a tieback anchor system. If a concrete Deadman and tie rod system is installed, excavation to at least mean low water (MLW) to place the concrete will be required. Dewatering and/or working with the tidal schedule will likely be required to complete this work. For IMS budgeting, the cost for the new seawall system is estimated to be about 50% more than the system in place currently; most of the increased cost is expected to be associated with the anchor system if a Deadman or drilled tieback system is used.

The alternatives for the Hamill Wall are similar to alternates 1, 4, and 5 of the marina bulkheads, or replace, strengthen and add a wood frame to the top of wall, and strengthen the existing wall and add a system by muscle walls. Full replacement is estimated to cost about $210,000 with strengthening and splicing to the top estimated at $70,000.

Alternatives for the Dune

Alternate-1
Muscle walls (heavy plastic interlocking barriers filled with water or sand) covered with a water-resistant liner could line the low-lying areas of Little Beach, increasing the resiliency of the shorefront to elevation 9 NAVD88. The estimated cost is $275,000, however, the Town's Department of Natural Resources indicated this would be considered a "hard-structure" and not suitable for the dune areas or consistent with local and State wetland regulations. The use of muscle walls was discussed with Horsley Witten, who indicated they would not be interested in providing services for this option due to wildlife obstruction with long-term use and general unattractiveness. The linear foot costs of $140.00 per unit and $175.00 for installation/maintenance were used for this evaluation. The estimated cost of this alternative is $497,700. Pursuit of this option has ceased.

Alternate-2
Leverage the old roadbed of Little Beach Road to provide a portion of upgraded defenses. The dunes in other areas would remain as shown on the drawings and described in other parts of this

application. It was determined the embankment could not be constructed in the confined of the roadbed, as it will be higher than the dunes along the beach resulting in substantially more material and costs. Clearing of vegetation and potential wetland fill requirements would be necessary. The approximate costs to raise these elevations to 9 ft NAVD88 are $200,000.

Conclusion

The selected alternative (proposed) is to elevate the existing dune to a minimal height of 9 feet where current dune crest elevations are under 9.0 ft NAVD88 on the upland side of the mean high water mark. The opinion of construction cost for the selected alternative is $630,350.

Existing Conditions and Storm Flooding and Damage Photos

View from Little Beach, looking north, salt marsh on the right.

View from Little Beach, looking west.

Little Beach, view looking north.

View southwest on Little Beach.

Seagull Road looking north, 2018.

Oceanfront Condos on Starfish Lane, 2018.

Seagull Lane, facing south towards Oceanfront Condos and OHM.

OHM entrance.

Sand bags at Little Beach.

Road under water.

Residential house in Little Beach neighborhood.

View from Little Beach, looking west towards Seagull Lane.

High tide at the Outermost Harbor Marine three days after the March 2019 full moon.

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Basemap: Clarity World Imagery

Legend

- Locus
- Chatham Parcels

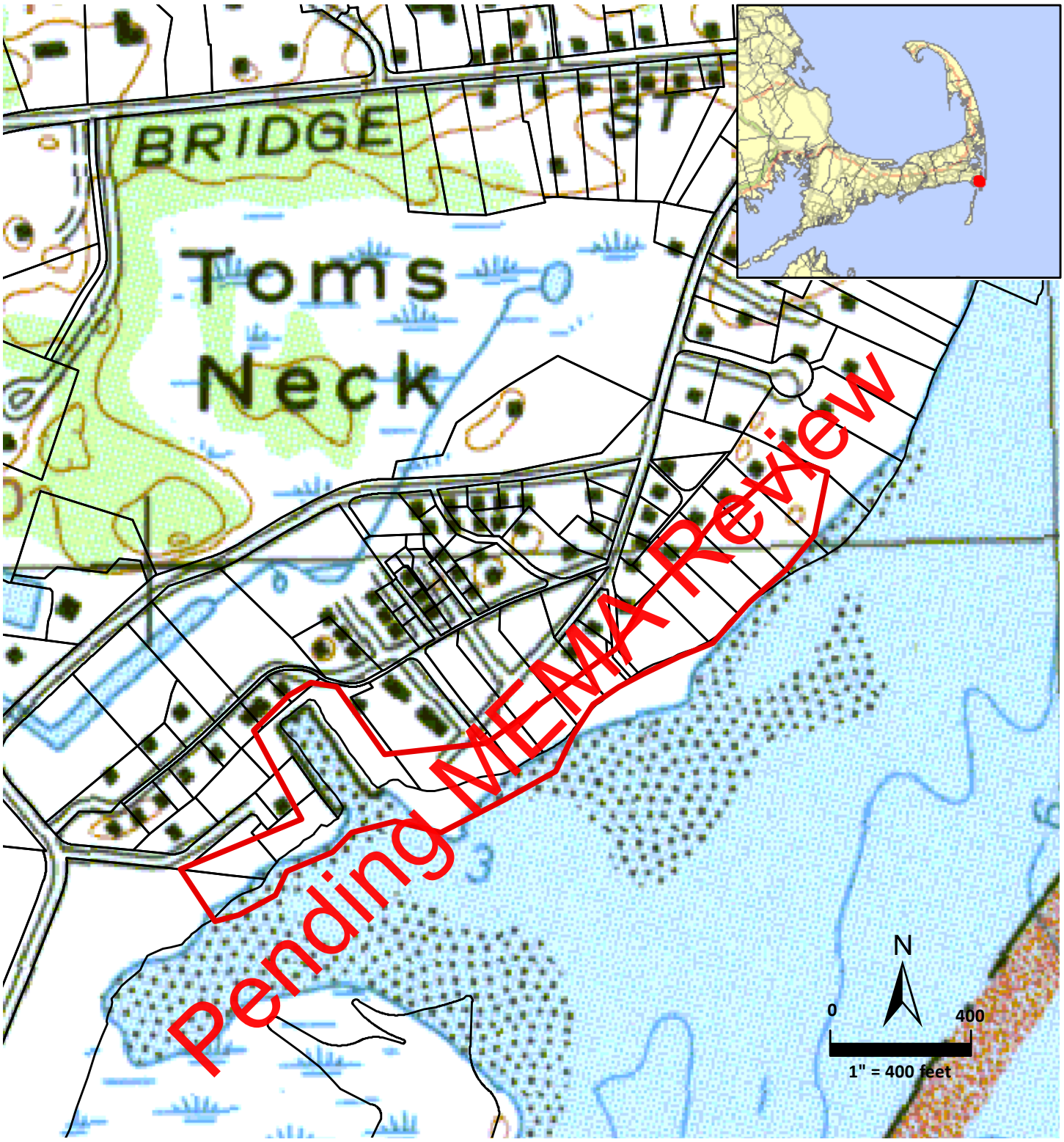
Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-8600 • horsleywitten.com

Aerial
Little Beach
Chatham, MA

Date: 3/29/2019

Figure 1

*Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Document Path: H:\Projects\2018\18169 Little Beach Assoc. Flood Resiliency\GIS\Maps\LocusMaps\MEMA\USGS - fig 2.mxd

Basemap: USGS Quadrant

Legend

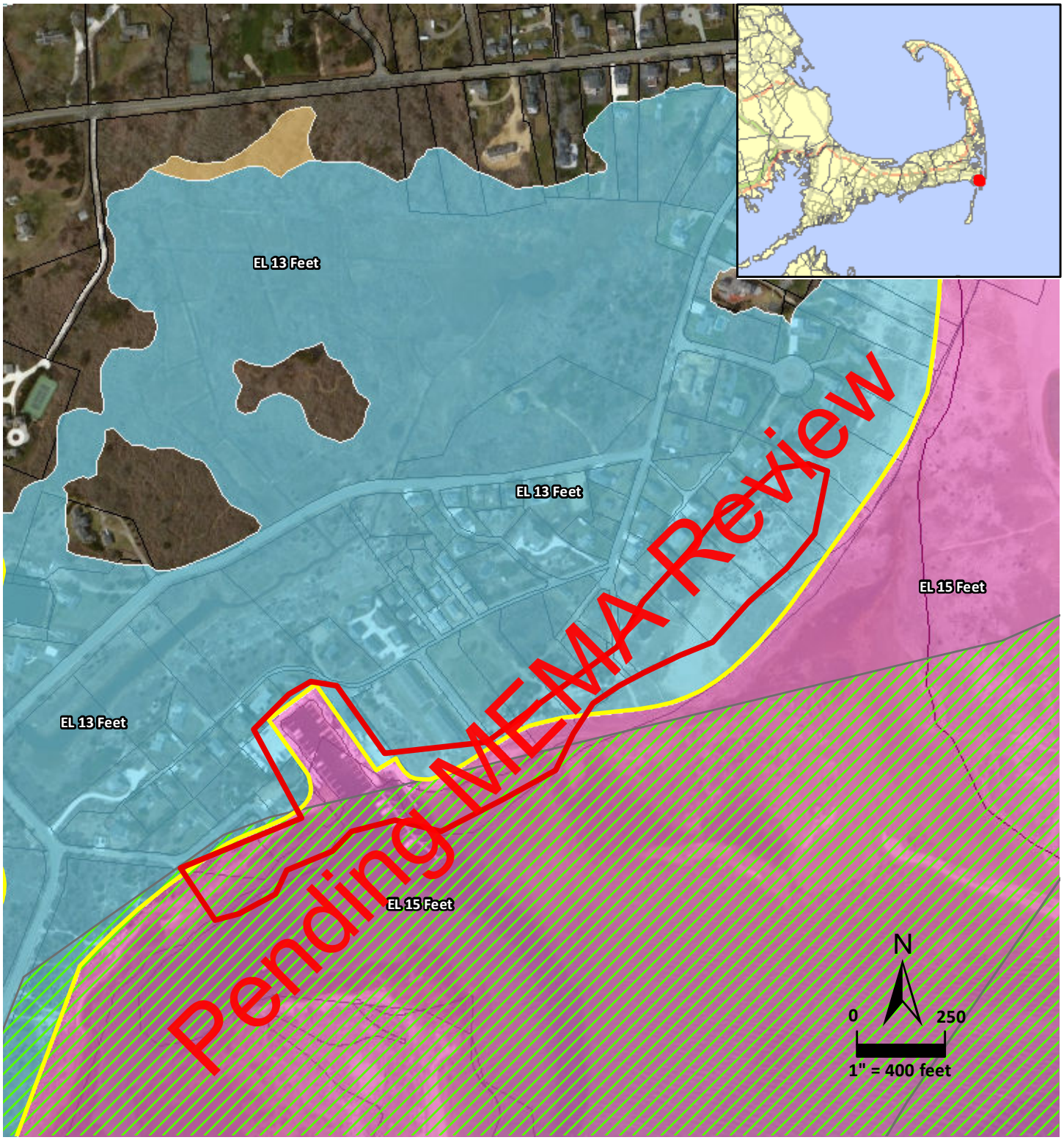
- Locus
- Chatham Parcels

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-8600 • horsleywitten.com

USGS
Little Beach
Chatham, MA

Date: 3/29/2019

Figure 2



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Legend

Basemap: Clarity World Imagery

- Parcels
- Locus
- Limit of Moderate Wave Action
- Coastal Barrier Resources System Area
- 0.2% Annual Chance Flood Hazard
- Zone AE - 1% Annual Chance Flood Hazard
- Zone VE - 1% Annual Chance Flood Hazard

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FEMA's National Flood Hazard Layer
Little Beach
Chatham, MA

Date: 3/29/2019

Figure 3

National Flood Hazard Layer FIRMette

FEMA

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

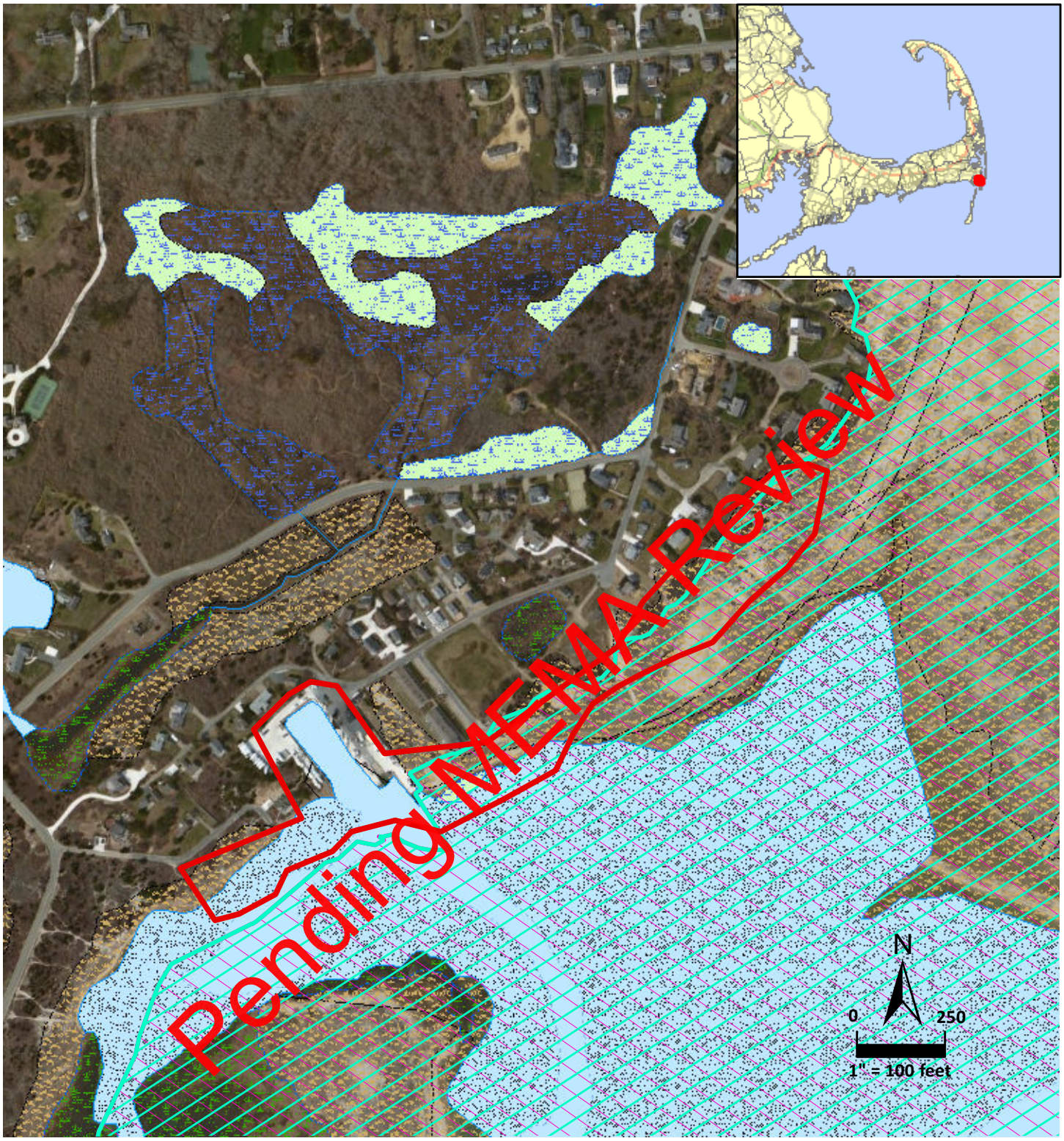
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/23/2019 at 2:10:25 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



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Legend

- Marsh/Bog
- Wooded marsh
- Salt Marsh
- Open Water
- Tidal Flats
- Beach/Dune
- Locus
- NHESP Certified Vernal Pools
- Potential Vernal Pools
- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- Shoreline
- Hydrologic Connection
- Mean Low Water Line
- Wetland Limit
- Closure Line

Basemap: Clarity World Imagery

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Existing Constraints
Little Beach
Chatham, MA

Date: 3/29/2019

Figure 4

Document Path: H:\Projects\2018\18169 Little Beach Assoc. Flood Resiliency\GIS\Maps\LocusMaps\MEMA\RegulatedAreas - figure 5.mxd

Legend

- Locus
- Parcels
- Underground Storage Tanks

Basemap: Clarity World Imagery

N

0 400

1" = 400 feet

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Regulated Areas
Little Beach
Chatham, MA

Date: 3/29/2019

Figure 5

Document Path: H:\Projects\2018\18169 Little Beach Assoc. Flood Resiliency\GIS\Maps\LocusMaps\MEMA\ProjComp - fig 6.mxd

Legend

Basemap: Clarity World Imagery

- Project Components
- Chatham Parcels
  - 1 - Southwest Dune
  - 2 - Hamill Wall
  - 3 - Outermost Harbor Marine
  - 4 - Oceanfront Condominium Dune
  - 5 - Northeast Dune

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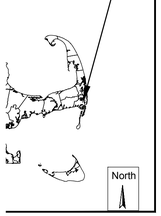
Project Components
Little Beach
Chatham, MA

Date: 4/2/2019

Figure 6

ΓLE BEACH COASTAL RESILIENCY
DUNE STABILIZATION
CHATHAM, MASSACHUSETTS
MARCH 2019

'OWN



TE

VICINITY MAP
Graphic Scale
1-inch = 200-feet

Sheet List Table	
Sheet Number	Sheet Title
1	COVER
2	CONSTRUCTION NOTES
3	EXISTING CONDITIONS (SOUTH)
4	EXISTING CONDITIONS (CENTRAL)
5	EXISTING CONDITIONS (NORTH)
6	DEMOLITION & ERSC PLAN (SOUTH)
7	DEMOLITION & ERSC PLAN (CENTRAL)
8	DEMOLITION & ERSC PLAN (NORTH)
9	GRADING PLAN (SOUTH)
10	GRADING PLAN (CENTRAL)
11	GRADING PLAN (NORTH)
12	LANDSCAPE PLAN (SOUTH)
13	LANDSCAPE PLAN (CENTRAL)
14	LANDSCAPE PLAN (NORTH)
15	CONSTRUCTION DETAILS

GENERAL NOTES:

1. THIS PLAN SET IS FOR PERMITTING ONLY AND NOT FOR CONSTRUCTION.
2. SUPPLEMENTAL SURVEY CONDUCTED BY THE HORSLEY WITTEN GROUP, INC. (HWG) IN FEBRUARY, 2019.
3. PROPERTY LINES APPROXIMATE ONLY.
4. EXISTING SITE CONDITIONS DEPICTED HEREON ARE THE RESULT OF A LiDAR SURVEY CONDUCTED BY ARMY CORPS OF ENGINEERS IN 2018 AND SUPPLEMENTED BY HWG ON 02/05/2019.
5. THE SITE IS LOCATED WITHIN F.I.R.M ZONE AE (EL 13 FEET) AND ZONE VE (EL 15 FEET) AS SHOWN ON COMMUNITY PANEL NO. 25001C0637J DATED JULY 16, 2014.
6. THE RESOURCE DELINEATION SHOWN HEREON WAS CONDUCTED BY HWG ON JANUARY 23, 2019.
7. THE DRAWINGS PREPARED BY HWG ARE TO INCREASE THE RESILIENCE OF THE DUNES FACING THE ATLANTIC OCEAN. THE TOWN IS APPLYING FOR AN INTEGRATED PERMIT, WHICH WILL INCLUDE MEASURES AT THE MARINA TO PROVIDE SIMILAR RESILIENCY TO THE STABILIZED DUNES. INFORMATION ON THE MARINA WORK WILL BE PROVIDED SEPARATELY. THESE DRAWINGS WILL BE COORDINATED SUCH THAT THE CONNECTIONS TO THE PROPOSED DUNE ON THE SOUTH SIDE OF THE SEASIDE "HAMILL WALL" AND THE CONNECTION BETWEEN THE DUNE AND THE MARINA BULKHEAD ARE INTEGRATED.

Plan Set:

LITTLE BEACH COASTAL RESILIENCY
DUNE STABILIZATION
CHATHAM, MASSACHUSETTS

Prepared For:

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Prepared By:

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Registration:

DRAFT
NOT FOR CONSTRUCTION

Revisions

Rev.	Date	By	Appr.	Description
1				
2				
3				
4				
5				
6				
7				

Project Number: 18169

Sheet Number: 1 of 15

Drawing Number: C - 1

EROSION & SEDIMENT CONTROL NOTES

1. DESIGNATE THE SITE CONSTRUCTION FOREMAN AS THE ON-SITE PERSONNEL RESPONSIBLE FOR THE DAILY INSPECTION AND MAINTENANCE OF ALL SEDIMENT AND EROSION CONTROLS AND IMPLEMENTATION OF ALL NECESSARY MEASURES TO CONTROL EROSION AND PREVENT SEDIMENT FROM LEAVING THE SITE.
2. INSTALL ALL EROSION AND SEDIMENT CONTROL (ESC) MEASURES AS INDICATED ON DRAWINGS IN CONSULTATION WITH THE CONSERVATION AGENT, AND AN OWNER'S REPRESENTATIVE BEFORE ANY CONSTRUCTION ACTIVITIES BEGIN. INSPECT, MAINTAIN REPAIR AND REPLACE EROSION CONTROL MEASURES, AS NECESSARY, DURING THE ENTIRE CONSTRUCTION PERIOD OF THE PROJECT. THE SITE PERIMETER EROSION CONTROLS ARE THE DESIGNATED LIMIT OF WORK. INFORM ALL PERSONNEL WORKING ON THE PROJECT SITE THAT NO CONSTRUCTION ACTIVITY IS TO OCCUR BEYOND THE LIMIT OF WORK AT ANY TIME THROUGHOUT THE CONSTRUCTION PERIOD.
3. MAINTAIN A MINIMUM SURPLUS OF 25 FEET OF EROSION CONTROL BARRIER (SILT FENCE, STRAWBALE, &/OR SILT SOCK) ONSITE AT ALL TIMES.
4. PROTECT THE ADJACENT RESOURCE AREA FROM SEDIMENTATION DURING PROJECT CONSTRUCTION UNTIL ACCEPTANCE BY THE OWNER & IN CONFORMANCE WITH THE ORDER OF CONDITIONS.
5. KEEP THE LIMIT OF CLEARING, GRADING AND DISTURBANCES TO A MINIMUM WITHIN THE PROPOSED AREA OF CONSTRUCTION. PHASE THE SITE WORK IN A MANNER TO MINIMIZE AREAS OF EXPOSED SOIL. IF TREES ARE TO BE CUT ON THE ENTIRE SITE, CLEAR AND GRUB ONLY THOSE AREAS WHICH ARE ACTIVELY UNDER CONSTRUCTION. PROPERLY INSTALL THE SEDIMENTATION CONTROLS PRIOR TO BEGINNING ANY LAND CLEARING ACTIVITY AND/OR OTHER CONSTRUCTION RELATED WORK.
6. MONITOR LOCAL WEATHER REPORTS DURING CONSTRUCTION AND PRIOR TO SCHEDULING EARTHMOVING OR OTHER CONSTRUCTION ACTIVITIES WHICH LEAVE LARGE DISTURBED AREAS UNSTABILIZED. IF INCLEMENT WEATHER IS PREDICTED, USE BEST PROFESSIONAL JUDGEMENT AND GOOD CONSTRUCTION PRACTICES WHEN SCHEDULING CONSTRUCTION ACTIVITIES AND ENSURE THE NECESSARY EROSION CONTROL DEVICES ARE INSTALLED AND FUNCTIONING PROPERLY TO MINIMIZE EROSION FROM ANY IMPENDING WEATHER EVENTS.
7. INSPECT EROSION AND SEDIMENT CONTROL DEVICES AND STABILIZED SLOPES ON A WEEKLY BASIS AND AFTER EACH RAINFALL EVENT OF .25 INCH OR GREATER. REPAIR IDENTIFIED PROBLEMS WITHIN 24 HOURS TO ENSURE EROSION AND SEDIMENT CONTROLS ARE IN GOOD WORKING ORDER. RESET OR REPLACE MATERIALS AS REQUIRED.
8. SURROUND THE PERIMETER OF SOIL STOCKPILES WITH SILT SOCK, SILT FENCE, STRAWBALES, OR A COMBINATION OF SILT FENCE WITH STRAWBALE, AS DETERMINED NECESSARY.
9. DISTURBED AREAS AND SLOPES MUST NOT BE LEFT UNATTENDED OR EXPOSED FOR EXCESSIVE PERIODS OF TIME SUCH AS THE INACTIVE WINTER SEASON. PROVIDE APPROPRIATE STABILIZATION PRACTICES ON ALL DISTURBED AREAS AS SOON AS POSSIBLE BUT NOT MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT AREA HAS TEMPORARILY OR PERMANENTLY CEASED; REINFORCE TEMPORARY AREAS HAVING A SLOPE GREATER THAN 4:1 WITH EROSION BLANKETS OR APPROVED EQUAL UNTIL THE SITE IS PROPERLY STABILIZED. TEMPORARY SWALES MAY ALSO BE REQUIRED IF DETERMINED NECESSARY IN THE FIELD BY THE ENGINEER.
10. INSTALL A SILT SACK OR APPROVED EQUIVALENT IN EACH EXISTING CATCHBASIN RECEIVING RUNOFF FROM THE SITE. UPON THE INSTALLATION OF EACH CATCH BASIN, INSTALL A SILT SACK OR APPROVED EQUIVALENT. INSPECT SILT SACKS, AFTER EACH SIGNIFICANT STORM EVENT AND REMOVE AND EMPTY AS NEEDED FOR THE DURATION OF THE CONSTRUCTION PERIOD.
11. SMALL SEDIMENTATION BASINS MAY BE CONSTRUCTED ON AN AS-NEEDED BASIS DURING CONSTRUCTION TO AID IN THE CAPTURE OF SITE RUNOFF AND SEDIMENT. IT WILL BE THE RESPONSIBILITY OF THE SITE CONTRACTOR, IN CONSULTATION WITH THE ENGINEER, TO SIZE AND CREATE THESE BASINS IN APPROPRIATE LOCATIONS.
12. CONTAIN ALL SEDIMENT ONSITE. SWEEP ALL EXITS FROM THE SITE AS NECESSARY INCLUDING ANY SEDIMENT TRACKING. SWEEP PAVED AREAS AS NEEDED TO REMOVE SEDIMENT AND POTENTIAL POLLUTANTS ACCUMULATED DURING SITE CONSTRUCTION.
13. REMOVE ACCUMULATED SEDIMENT FROM ALL TEMPORARY PRACTICES AND DISPOSE OF IN A PRE-APPROVED LOCATION.
14. PROVIDE ON SITE OR MAKE READILY AVAILABLE THE NECESSARY EQUIPMENT AND SITE PERSONNEL DURING CONSTRUCTION HOURS FOR THE DURATION OF THE PROJECT TO ENSURE ALL EROSION AND SEDIMENTATION CONTROL DEVICES ARE PROPERLY MAINTAINED AND REPAIRED IN A TIMELY AND RESPONSIBLE MANNER. IF SITE WORK IS SUSPENDED DURING THE WINTER MONTHS THE CONTRACTOR MUST CONTINUE TO PROVIDE PERSONNEL AND EQUIPMENT EITHER ON SITE OR READILY AVAILABLE TO PROPERLY MAINTAIN AND REPAIR ALL EROSION AND SEDIMENTATION CONTROL DEVICES IN A TIMELY AND RESPONSIBLE MANNER
15. PRIOR TO THE INSTALLATION OF FILTER FABRIC AND MEDIA WITHIN THE BIORETENTION AREAS, REMOVE AND PROPERLY DISPOSE OF SEDIMENT ACCUMULATED IN ANY PARTIALLY CONSTRUCTED OR TEMPORARY BIORETENTION/DRAINAGE AREA USED FOR SEDIMENT CONTROL DURING CONSTRUCTION. PROVIDE A SURFACE ELEVATION AT A MINIMUM 1-FOOT ABOVE THE BOTTOM OF MEDIA ELEVATION AS SHOWN IN THE BIORETENTION SCHEDULE FOR PARTIALLY CONSTRUCTED BIORETENTION AREAS. THIS ALLOWS FOR AN OVER-DIG OF THE COLLECTED SEDIMENT FROM WITHIN THE BIORETENTION AREA PRIOR TO MEDIA/FABRIC INSTALLATION.
16. CONTROL DUST BY WATERING OR OTHER APPROVED METHODS AS NECESSARY, OR AS DIRECTED BY THE ENGINEER.
17. THE CONTRACTOR IS RESPONSIBLE FOR THE INSPECTION AND MAINTENANCE DURING CONSTRUCTION OF ALL STORMWATER FACILITIES INSTALLED OR AFFECTED BY THE PROJECT. REMOVE SEDIMENT OR DEBRIS COLLECTED WITHIN THESE FACILITIES FROM THE PROJECT WORK PRIOR TO THE OWNER'S ACCEPTANCE.

GENERAL DEMOLITION NOTES

THIS PLAN SET DOES NOT INCLUDE DETAILS & SPECIFICATIONS FOR ALL DEMOLITION WORK REQUIRED WITHIN THE PROPOSED CONSTRUCTION LIMITS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE OWNER, PROJECT ARCHITECT, MECHANICAL ENGINEERS AND OTHER PROJECT ENGINEERS INVOLVED WITH THE PROPOSED NEW CONSTRUCTION TO DEVELOP A SUITABLE DEMOLITION PLAN, WHICH WILL ALLOW THE FACILITIES TO REMAIN IN OPERATION DURING THE ENTIRETY OF CONSTRUCTION.

1. UNLESS OTHERWISE NOTED, THE CONTRACTOR IS RESPONSIBLE FOR THE RELOCATION, DEMOLITION, REMOVAL AND DISPOSAL, IN A LOCATION APPROVED BY ALL GOVERNING AUTHORITIES, OF ALL EXISTING SITE ELEMENTS AND STRUCTURES INCLUDING, BUT NOT LIMITED TO, BUILDINGS, ROADWAYS, PARKING AREAS, PARKING ISLANDS, BITUMINOUS CONCRETE, CEMENT CONCRETE, GRAVEL, CURBS, WALKWAYS, SIDEWALKS, BERMS, FENCES, BOLLARDS, POSTS, PLANTING BEDS, TREES, SHRUBS, UTILITIES, DRAINAGE STRUCTURES AND ALL OTHER STRUCTURES SHOWN AND NOT SHOWN WITHIN CONSTRUCTION LIMITS, AND WHERE NEEDED, TO ALLOW FOR NEW CONSTRUCTION. ALL FACILITIES TO BE REMOVED ARE TO BE UNDERCUT TO SUITABLE MATERIAL AND BROUGHT TO GRADE WITH SUITABLE COMPACTED FILL MATERIAL PER SPECIFICATIONS.
2. REMOVE ALL DEBRIS FROM THE SITE AND DISPOSE OF THE DEBRIS IN A PROPER AND LEGAL MANNER.
3. OBTAIN ALL PERMITS REQUIRED FOR DEMOLITION AND DISPOSAL.
4. COORDINATE WITH RESPECTIVE UTILITY COMPANIES PRIOR TO THE REMOVAL AND/OR RELOCATION OF UTILITIES. COORDINATE WITH THE UTILITY COMPANIES CONCERNING PORTIONS OF THE WORK WHICH MAY BE PERFORMED BY THE UTILITY COMPANY AND ANY FEES WHICH ARE TO BE PAID TO THE UTILITY COMPANY FOR THEIR SERVICES. THE CONTRACTOR IS RESPONSIBLE FOR PAYING ALL FEES AND CHARGES.
5. PROVIDE NOTICE TO ALL UTILITY COMPANIES REGARDING DESTRUCTION AND REMOVAL OF ALL SERVICE LINES AND CAP ALL UTILITY LINES, AS REQUIRED, BEFORE PROCEEDING WITH THE WORK.
6. MAINTAIN CONTINUOUS ACCESS AND OPERATION FOR SURROUNDING FACILITIES, AS DEEMED BY THE OWNER, AT ALL TIMES DURING DEMOLITION OF THE EXISTING FACILITIES.
7. PRIOR TO DEMOLITION OCCURRING, ALL EROSION CONTROL DEVICES ARE TO BE INSTALLED.

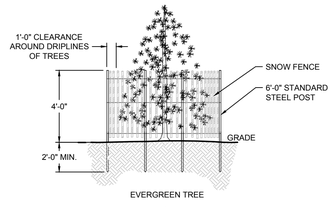
GENERAL GRADING AND DRAINAGE NOTES

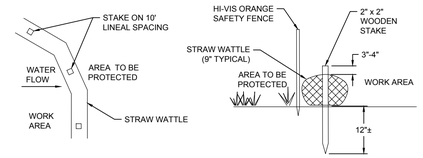
1. ALL CUT AND FILL SLOPES SHALL BE 4:1 OR FLATTER UNLESS OTHERWISE NOTED.
2. EXISTING GRADE CONTOUR INTERVALS SHOWN AT 1 FOOT.
3. PROPOSED GRADE CONTOUR INTERVALS SHOWN AT 1 FOOT.
4. ADJUST AND/OR CUT EXISTING PAVEMENT AS NECESSARY TO ASSURE A SMOOTH FIT AND CONTINUOUS GRADE.
5. PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDINGS FOR ALL NATURAL AND PAVED AREAS. IMMEDIATELY NOTIFY THE ENGINEER IF POSITIVE DRAINAGE CANNOT BE PROVIDED.
6. PROPOSED ELEVATIONS ARE SHOWN TO FINISH PAVEMENT OR GRADE UNLESS NOTED OTHERWISE.

PROPOSED LEGEND:

GENERAL	SYMBOLS
	CENTERLINE
44	CONTOUR - MINOR
50	CONTOUR - MAJOR
x x	FENCE - CHAIN LINK
	LIMIT OF WORK
	CONSTRUCTION ENTRANCE
	STORMWATER AREA
	MOBIMAT (HANDICAP ACCESS)
	CLEAR & GRUB EX. VEGETATION
	BIT. PAVEMENT REMOVAL
	INVASIVE SPECIES REMOVAL
EROSION & SEDIMENT CONTROL	
HVF	HIGH VISIBILITY FENCING
HVF-SW	HIGH VISIBILITY FENCING & STRAW WATTLE
SF	HEAVY DUTY SILT FENCE
	TREE PROTECTION
	CREST COIR - 48" OR MORE OF FILL
	CREST COIR - 24"- 48" OF FILL
	TOE PROTECTION COIR

+ SPOT GRADE EL-95.00

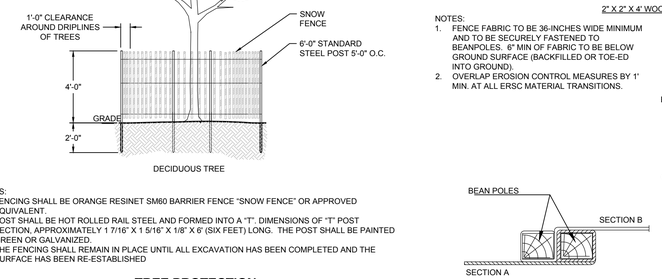




PLAN VIEW **SECTION**

NOTES:.
1. FOLLOWING CONSTRUCTION AND SITE STABILIZATION, STRAW WATTLE AND HIGH-VIS SAFETY FENCING IS TO BE REMOVED AS APPROVED BY THE ENGINEER AND IS TO BE REPLACED BY SAND FENCING AS SHOWN ON THE LANDSCAPE PLANS.

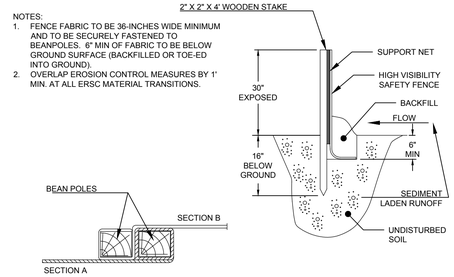
STRAW WATTLE WITH SAFETY FENCE
NOT TO SCALE



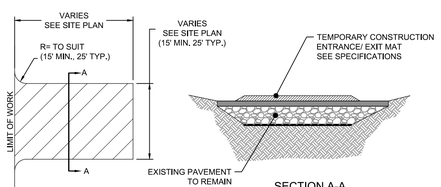
NOTES:
1. FENCING SHALL BE ORANGE RESINET SM60 BARRIER FENCE "SNOW FENCE" OR APPROVED EQUIVALENT.
2. POST SHALL BE HOT ROLLED RAIL STEEL AND FORMED INTO A "T". DIMENSIONS OF "T" POST SECTION, APPROXIMATELY 1 7/16" X 1 5/16" X 1/8" X 6' (SIX FEET) LONG. THE POST SHALL BE PAINTED GREEN OR GALVANIZED.
3. THE FENCING SHALL REMAIN IN PLACE UNTIL ALL EXCAVATION HAS BEEN COMPLETED AND THE SURFACE HAS BEEN RE-ESTABLISHED

TREE PROTECTION
NOT TO SCALE

NOTES:
1. FOLLOWING CONSTRUCTION AND SITE STABILIZATION, STRAW WATTLE AND HIGH-VIS SAFETY FENCING IS TO BE REMOVED AS APPROVED BY THE ENGINEER AND IS TO BE REPLACED BY SAND FENCING AS SHOWN ON THE LANDSCAPE PLANS.
2. OVERLAP EROSION CONTROL MEASURES BY 1' MIN. AT ALL ERSC MATERIAL TRANSITIONS.



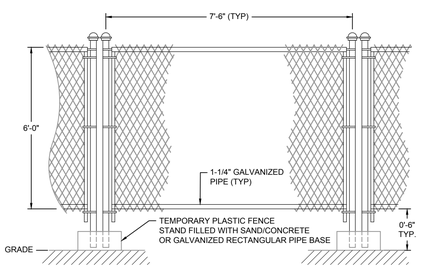
TOP VIEW



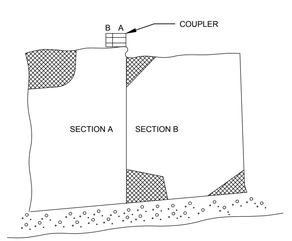
PLAN VIEW SECTION A-A

NOTE:
1. CONSTRUCTION ENTRANCE(S) ARE TO REMAIN UNTIL TRUCK TRAFFIC TO AND FROM THE SITE IS COMPLETE.
2. SEE SITE PLAN FOR LOCATION & ACTUAL DIMENSIONS

CONSTRUCTION ENTRANCE/EXIT
NOT TO SCALE



TEMPORARY CONSTRUCTION FENCE
NOT TO SCALE



JOINING SECTIONS OF FENCE

SAFETY FENCE
NOT TO SCALE

Revisions

Rev.	Date	By	Appr.	Description

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Checked By: RAC
Drawn By: EHH
Designed By: BA-EHH
Date: MARCH 2019

Plan Set: LITTLE BEACH COASTAL RESILIENCY DUNE STABILIZATION CHATHAM, MASSACHUSETTS

Plan Title: CONSTRUCTION NOTES

Prepared For:
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Phone: (508) 833-6600
Fax: (508) 833-3150
Dated: FEBRUARY 2019

Registration:

DRAFT NOT FOR CONSTRUCTION

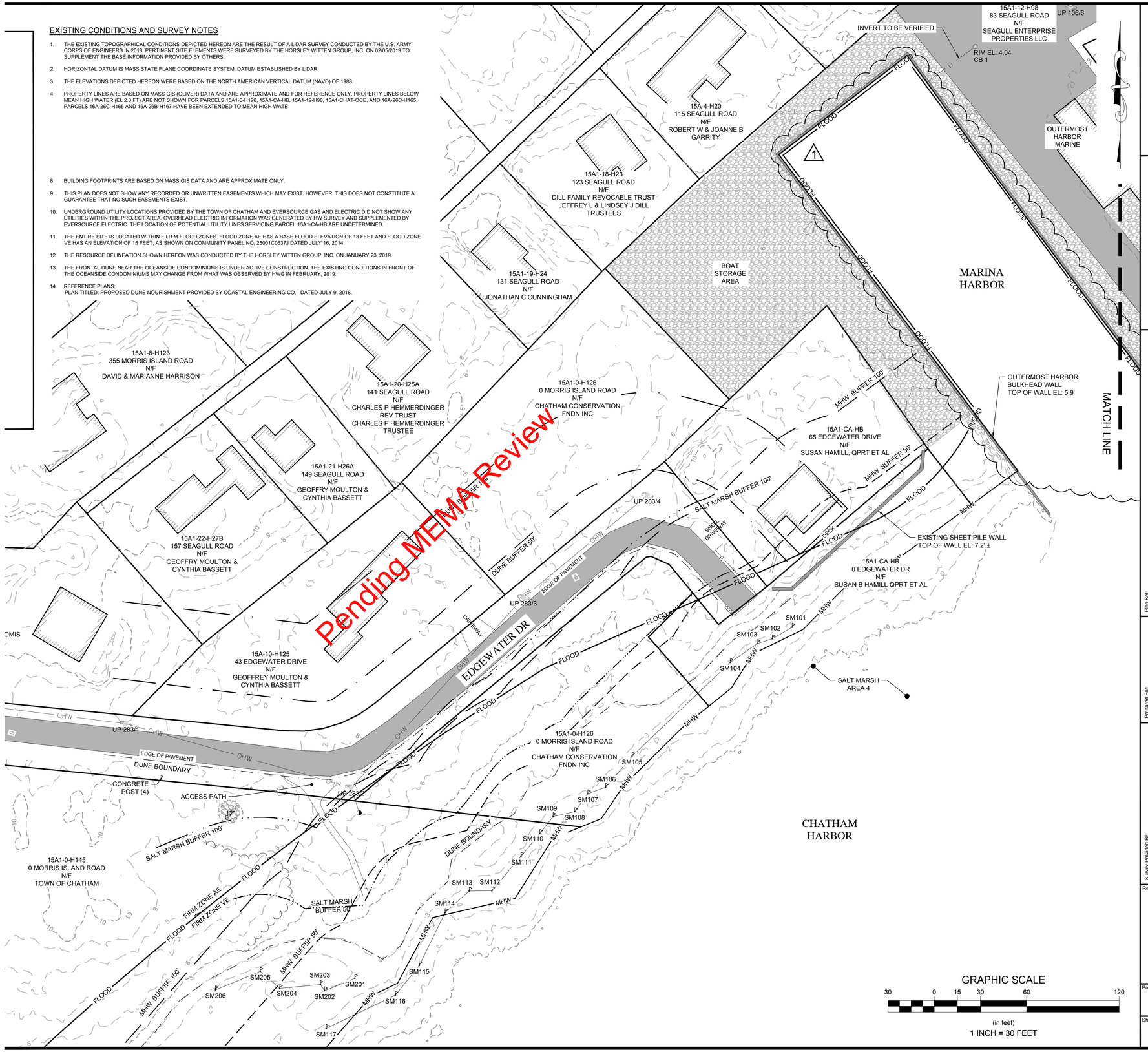
Project Number: 18169

Sheet : 2 of 15

Sheet Number: C - 2

EXISTING CONDITIONS AND SURVEY NOTES

1. THE EXISTING TOPOGRAPHICAL CONDITIONS DEPICTED HEREON ARE THE RESULT OF A LiDAR SURVEY CONDUCTED BY THE U.S. ARMY CORPS OF ENGINEERS IN 2018. PERTINENT SITE ELEMENTS WERE SURVEYED BY THE HORSLEY WITTEN GROUP, INC. ON 02/05/2019 TO SUPPLEMENT THE BASE INFORMATION PROVIDED BY OTHERS.
2. HORIZONTAL DATUM IS MASS STATE PLANE COORDINATE SYSTEM. DATUM ESTABLISHED BY LiDAR.
3. THE ELEVATIONS DEPICTED HEREON WERE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.
4. PROPERTY LINES ARE BASED ON MASS GIS (OLIVER) DATA AND ARE APPROXIMATE AND FOR REFERENCE ONLY. PROPERTY LINES BELOW MEAN HIGH WATER (EL 2.3 FT) ARE NOT SHOWN FOR PARCELS 15A1-0-H126, 15A1-CA-HB, 15A1-12-H98, 15A1-CHAT-OCE, AND 16A-26C-H165. PARCELS 16A-26C-H165 AND 16A-26B-H167 HAVE BEEN EXTENDED TO MEAN HIGH WATE
8. BUILDING FOOTPRINTS ARE BASED ON MASS GIS DATA AND ARE APPROXIMATE ONLY.
9. THIS PLAN DOES NOT SHOW ANY RECORDED OR UNWRITTEN EASEMENTS WHICH MAY EXIST. HOWEVER, THIS DOES NOT CONSTITUTE A GUARANTEE THAT NO SUCH EASEMENTS EXIST.
10. UNDERGROUND UTILITY LOCATIONS PROVIDED BY THE TOWN OF CHATHAM AND EVERSOURCE GAS AND ELECTRIC DID NOT SHOW ANY UTILITIES WITHIN THE PROJECT AREA. OVERHEAD ELECTRIC INFORMATION WAS GENERATED BY HW SURVEY AND SUPPLEMENTED BY EVERSOURCE ELECTRIC. THE LOCATION OF POTENTIAL UTILITY LINES SERVICING PARCEL 15A1-CA-HB ARE UNDETERMINED.
11. THE ENTIRE SITE IS LOCATED WITHIN F.I.R.M FLOOD ZONES. FLOOD ZONE AE HAS A BASE FLOOD ELEVATION OF 13 FEET AND FLOOD ZONE VE HAS AN ELEVATION OF 15 FEET, AS SHOWN ON COMMUNITY PANEL NO, 25001C0637J DATED JULY 16, 2014.
12. THE RESOURCE DELINEATION SHOWN HEREON WAS CONDUCTED BY THE HORSLEY WITTEN GROUP, INC. ON JANUARY 23, 2019.
13. THE FRONTAL DUNE NEAR THE OCEANSIDE CONDOMINIUMS IS UNDER ACTIVE CONSTRUCTION. THE EXISTING CONDITIONS IN FRONT OF THE OCEANSIDE CONDOMINIUMS MAY CHANGE FROM WHAT WAS OBSERVED BY HWG IN FEBRUARY, 2019.
14. REFERENCE PLANS:
PLAN TITLED: PROPOSED DUNE NOURISHMENT PROVIDED BY COASTAL ENGINEERING CO., DATED JULY 9, 2018.



GRAPHIC SCALE
30 0 15 30 60 120
(in feet)
1 INCH = 30 FEET

Revisions

Rev.	Date	By	Appr.	Description
1	03/08/19	BAL	RAC	PARCEL LINES & INFO

Horsley Witten Group, Inc.
Sustainable Environmental Solutions
www.horsleywitten.com
90 Route 6A
Sandwich, MA 02563
508-833-6600 voice
508-833-3150 fax

Designed By:
Drawn By: EHH
Checked By: RAC
Date: MARCH 2019

Plan Set: LITTLE BEACH COASTAL RESILIENCY
DUNE STABILIZATION
CHATHAM, MASSACHUSETTS

Plan Title: EXISTING CONDITIONS (SOUTH)

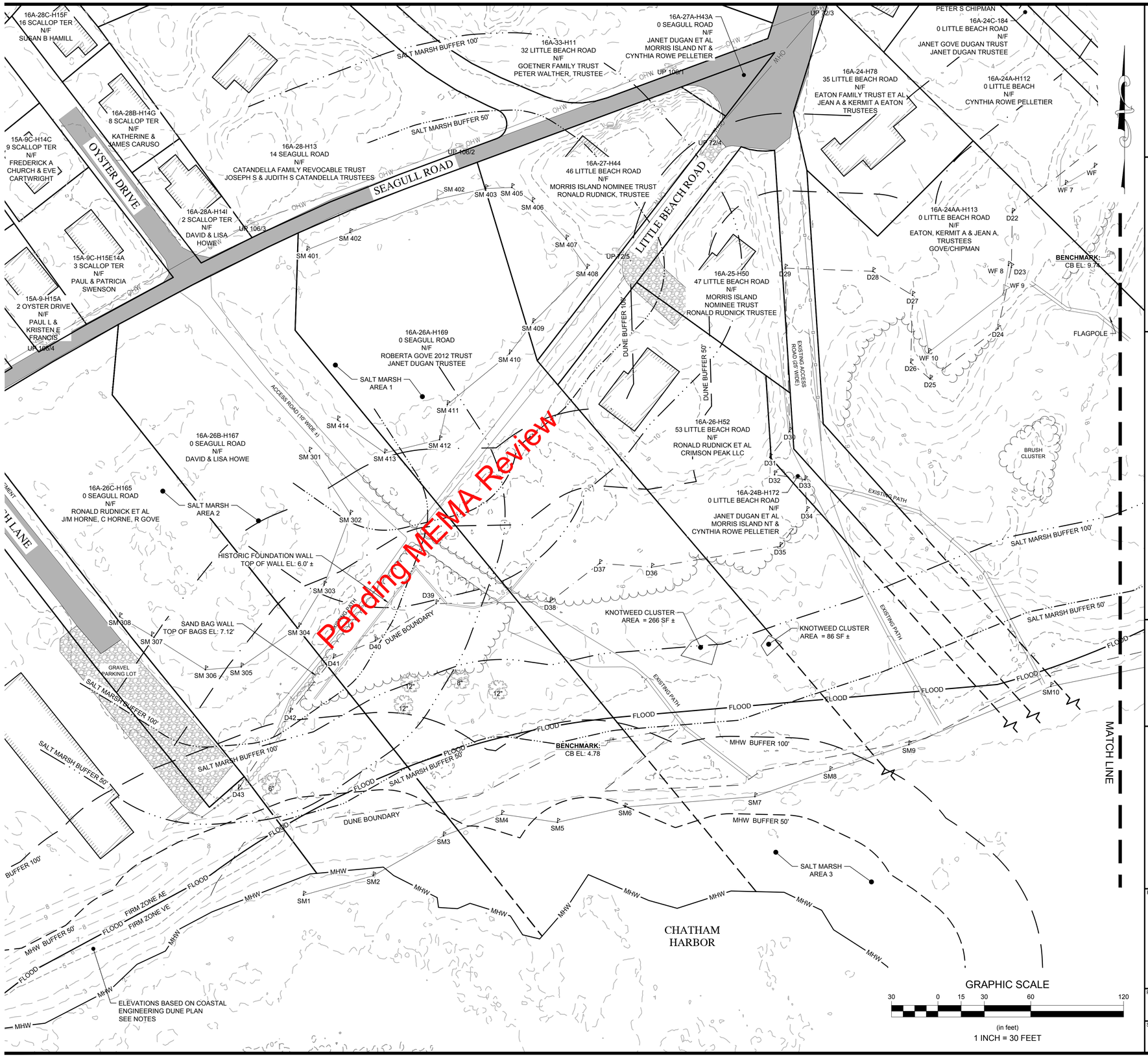
Prepared For:
Little Beach Association
PO Box 668
Chatham, MA 02633
Phone: (207) 205-7046

Survey Provided By:
Horsley Witten Group, Inc.
90 Route 6A
Sandwich, MA 02563
Phone: (508) 833-6600
Fax: (508) 833-3150
Dated: FEBRUARY 2019

Registration:
DRAFT
NOT FOR CONSTRUCTION

Project Number: 18169
Sheet : 3 of 15

Sheet Number: EX - 3



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Plan Set: LITTLE BEACH COASTAL RESILIENCY DUNE STABILIZATION CHATHAM, MASSACHUSETTS

Plan Title: EXISTING CONDITIONS (CENTRAL)

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Registration:

DRAFT
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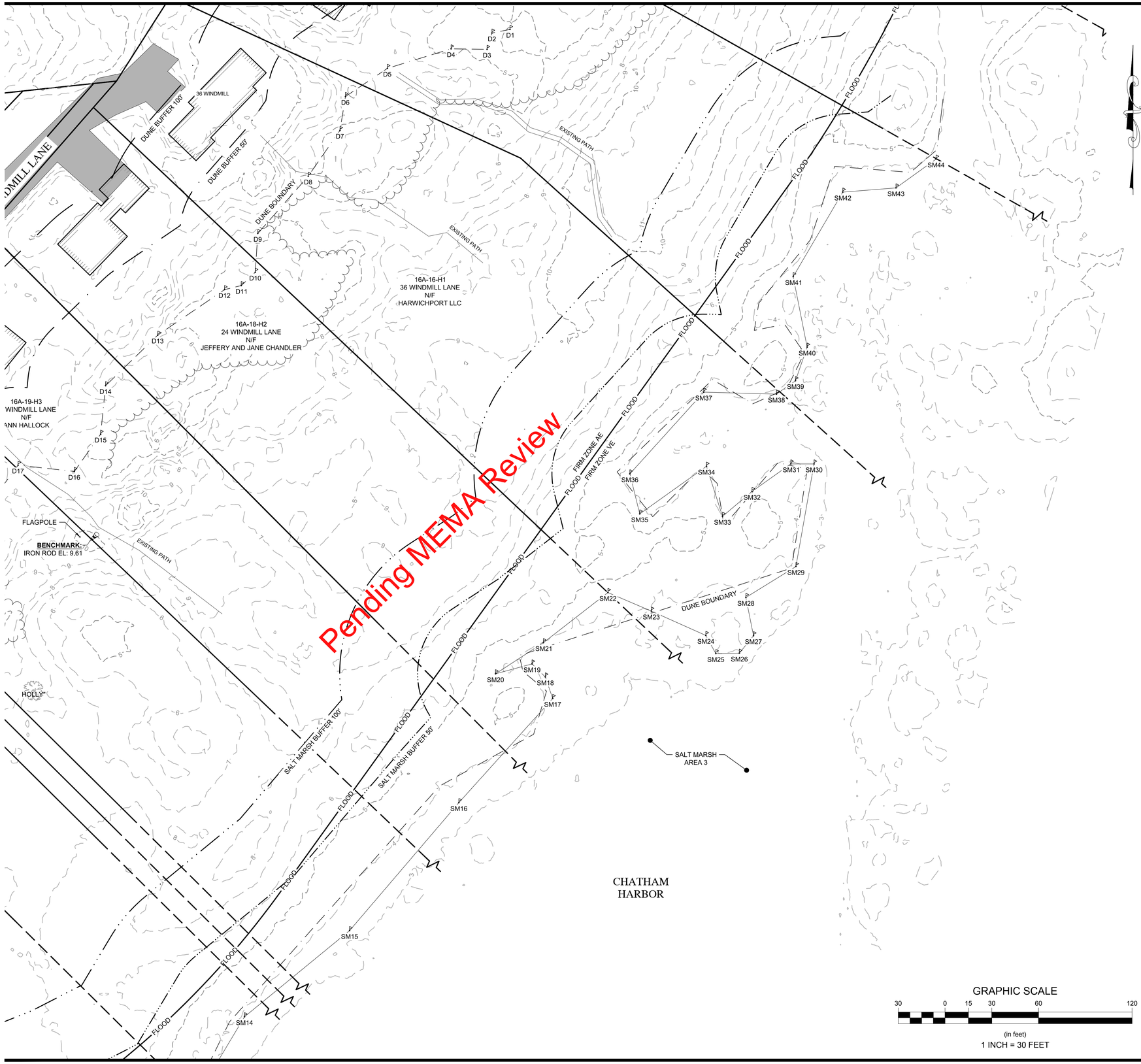
Project Number: 18169

Sheet : 4 of 15

Sheet Number: EX - 4



Revisions

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Drawn By: EHH
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Designed By:
Date: MARCH 2019

Plan Set: LITTLE BEACH COASTAL RESILIENCY DUNE STABILIZATION CHATHAM, MASSACHUSETTS

Plan Title: EXISTING CONDITIONS (NORTH)

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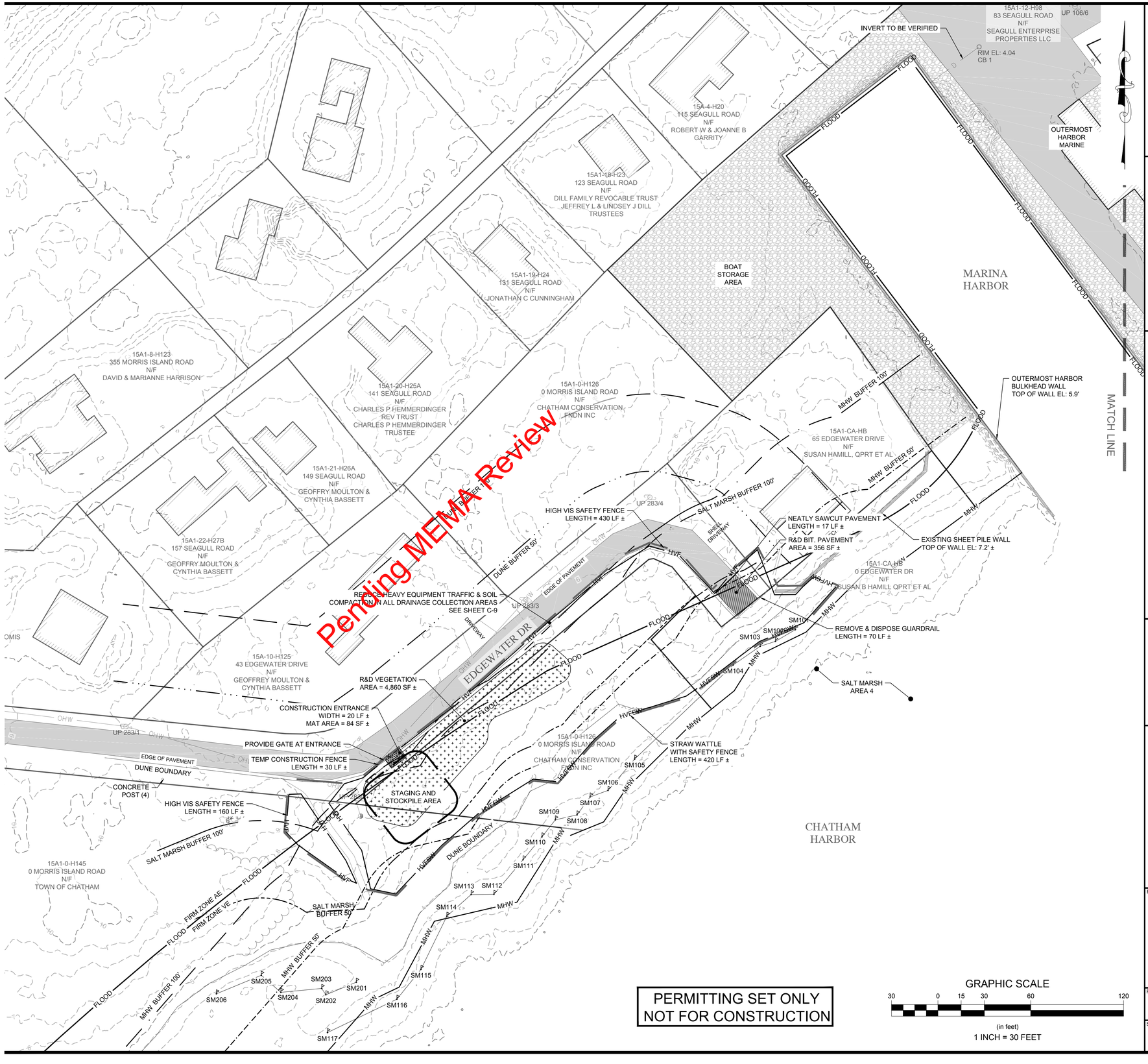
NOT FOR CONSTRUCTION

Project Number: 18169

Sheet : 5 of 15

Sheet Number: EX - 5



Revisions

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Horsley Witten Group, Inc.
Sustainable Environmental Solutions
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Designed By: SA-LEWH
Drawn By: EWH
Checked By: RAC
Date: MARCH 2019

Plan Set: LITTLE BEACH COASTAL RESILIENCY
DUNE STABILIZATION
CHATHAM, MASSACHUSETTS

Plan Title: DEMOLITION & ERSC PLAN (SOUTH)

Prepared For:
Little Beach Association
PO Box 668
Chatham, MA 02633
Phone: (207) 205-7046

Survey Provided By:
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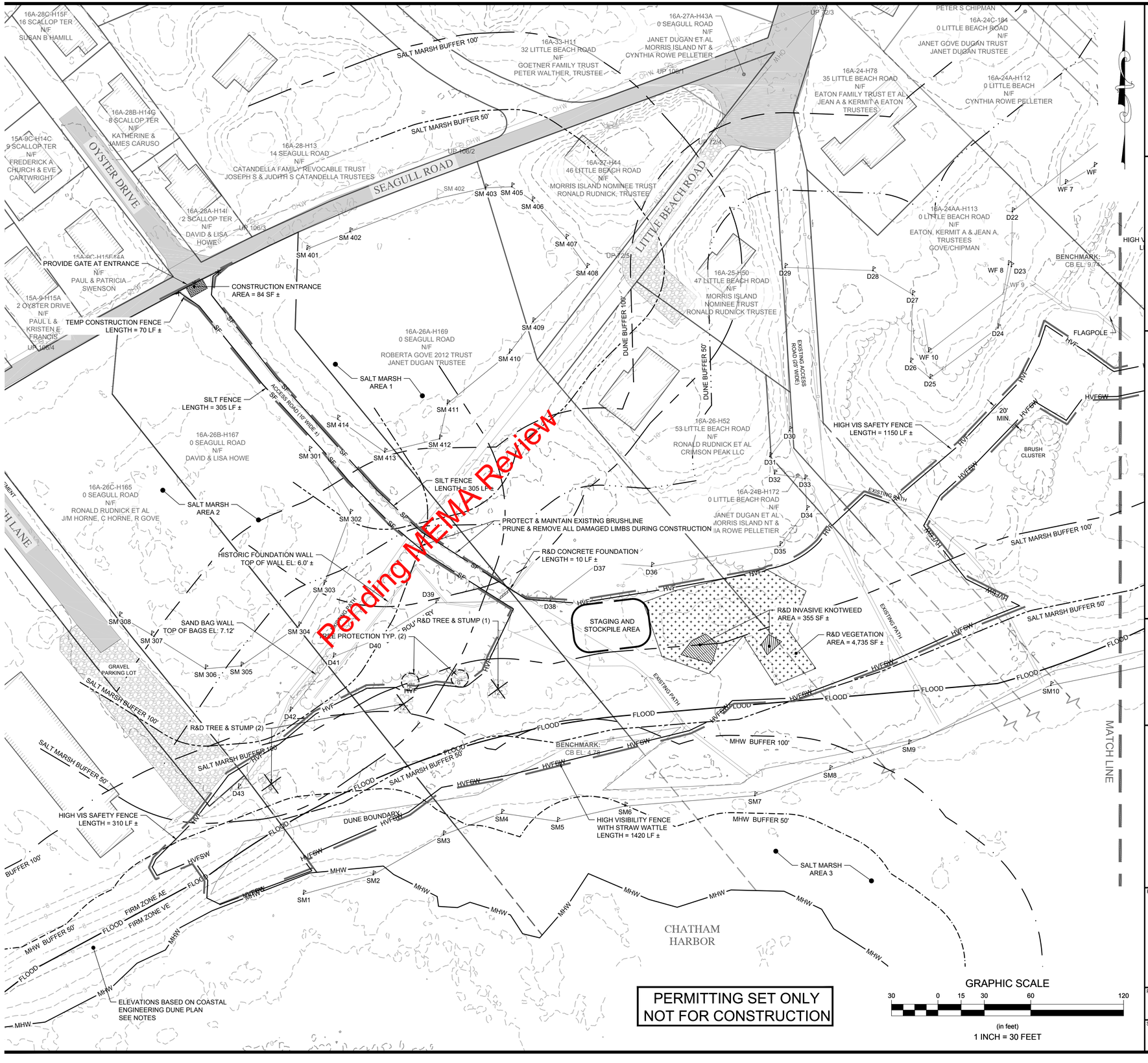
Registration:

DRAFT
NOT FOR
CONSTRUCTION

Project Number: 18169
Sheet : 6 of 15

Sheet Number: C - 6



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Checked By: RAG
Drawn By: EHH
Designed By: BA-EHH
Date: MARCH 2019

Plan Set: LITTLE BEACH COASTAL RESILIENCY
DUNE STABILIZATION
CHATHAM, MASSACHUSETTS

Plan Title: DEMOLITION & ERSC PLAN (CENTRAL)

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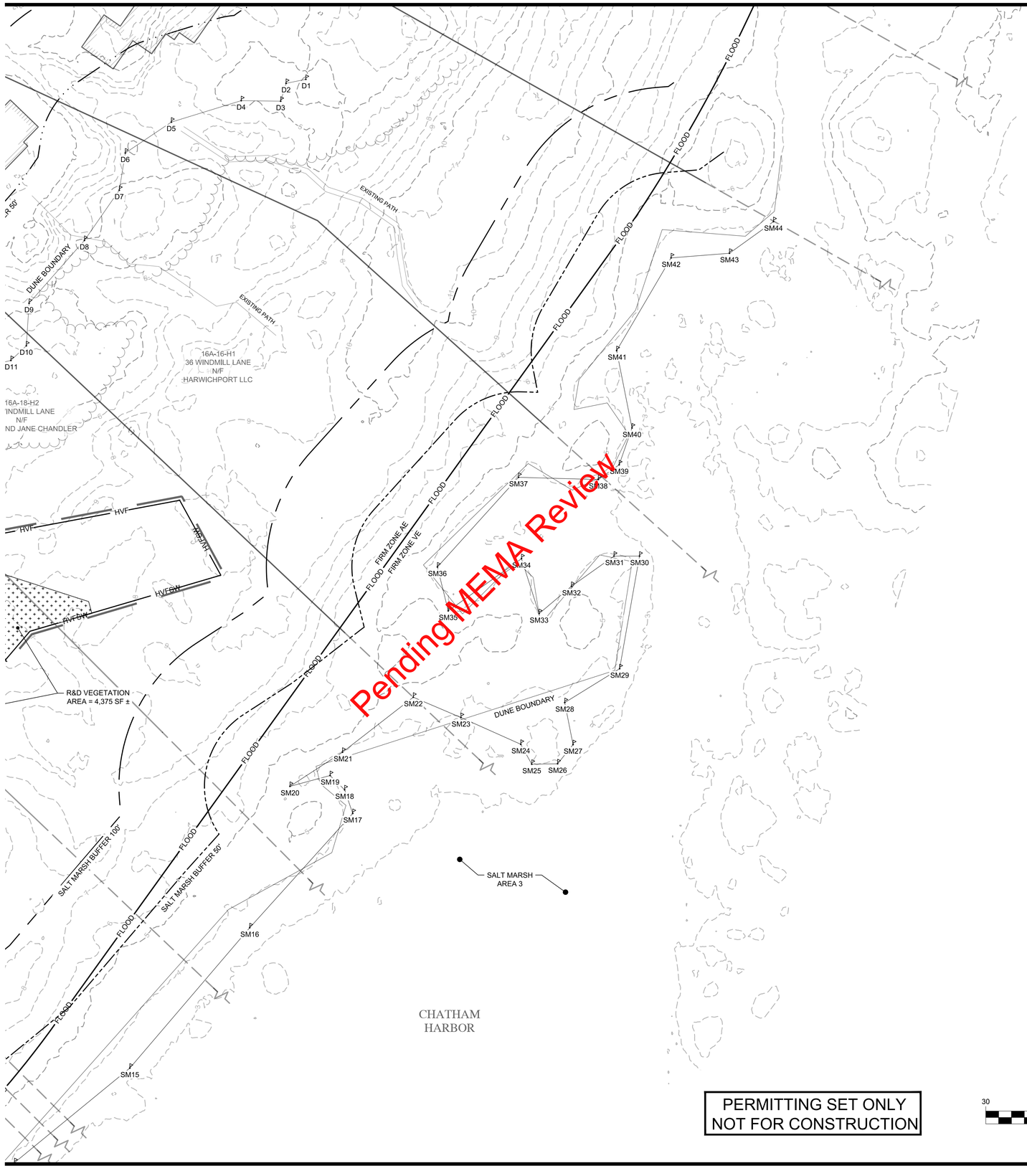
Sheet Number: C - 7



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Designed By: BA-EWH
Drawn By: EWH
Checked By: RAC
Date: MARCH 2019

Plan Set: LITTLE BEACH COASTAL RESILIENCY DUNE STABILIZATION CHATHAM, MASSACHUSETTS

Plan Title: DEMOLITION & ERSC PLAN (NORTH)

Prepared For:
Little Beach Association
PO Box 668
Chatham, MA 02633
Phone: (207) 205-7046
Fax: —

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Project Number: 18169

Sheet : 8 of 15

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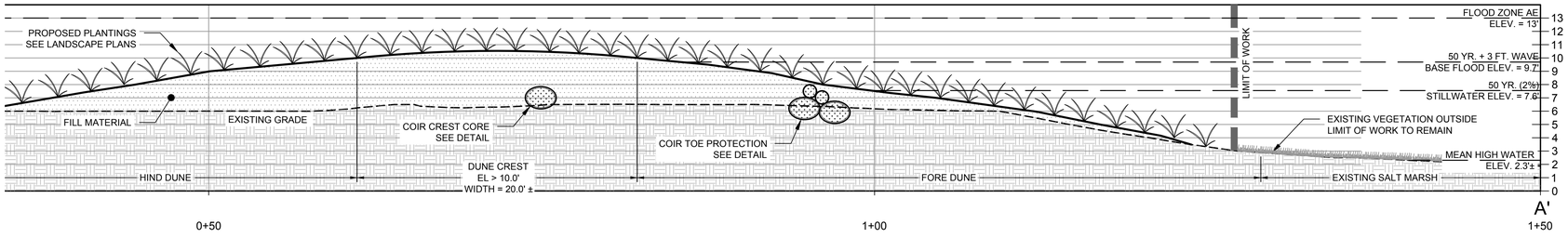
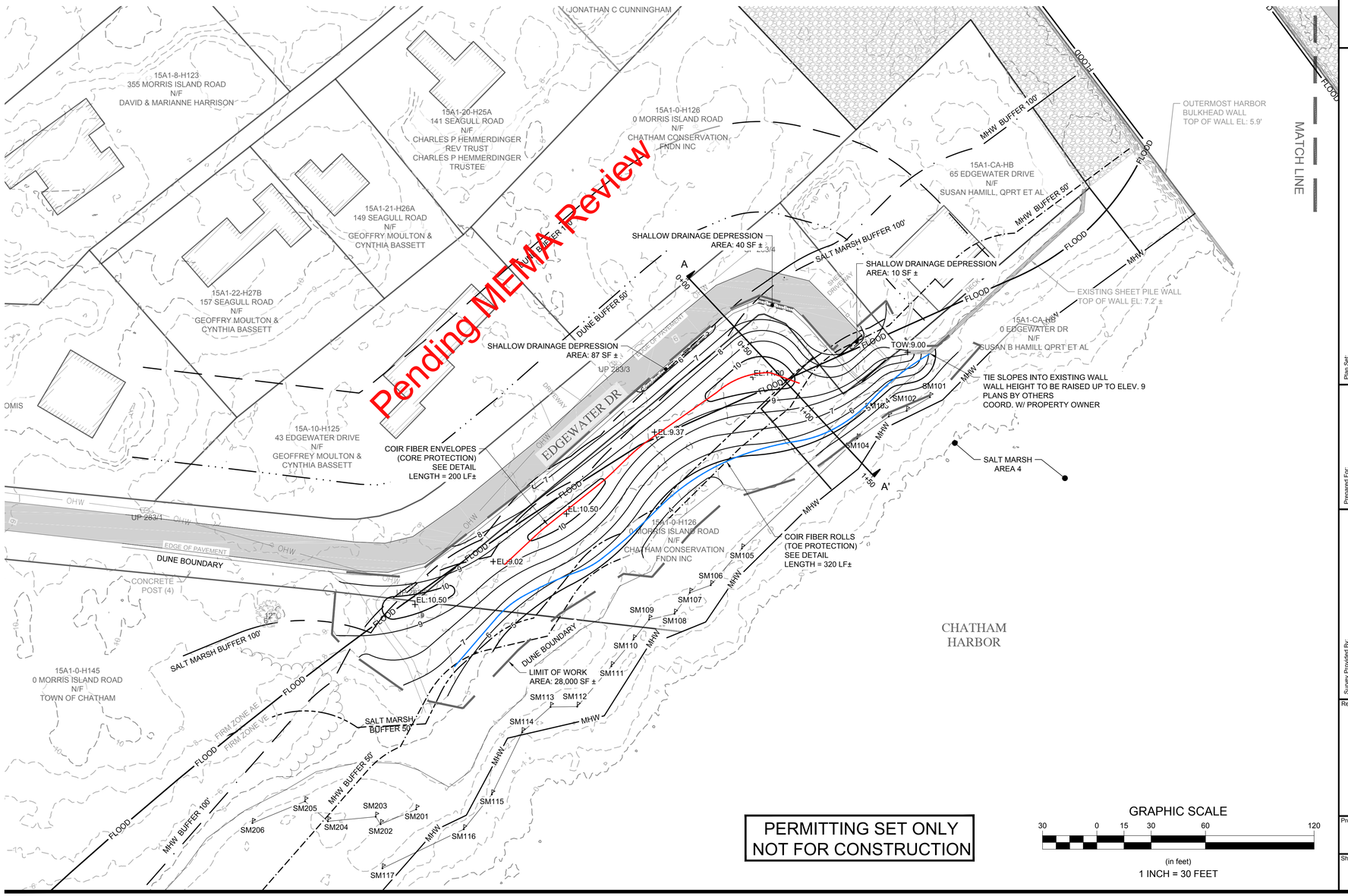


SECTION A-A' (SOUTH)
HORIZONTAL SCALE: 1" = 5'
VERTICAL SCALE: 1" = 5'



PERMITTING SET ONLY
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GRAPHIC SCALE
30 0 15 30 60 120
(in feet)
1 INCH = 30 FEET

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Drawn By: EHH
Designed By: BA-EHH
Date: MARCH 2019

Plan Set: LITTLE BEACH COASTAL RESILIENCY
DUNE STABILIZATION
CHATHAM, MASSACHUSETTS

Plan Title: GRADING PLAN (SOUTH)

Prepared For:
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Project Number: 18169
Sheet : 9 of 15

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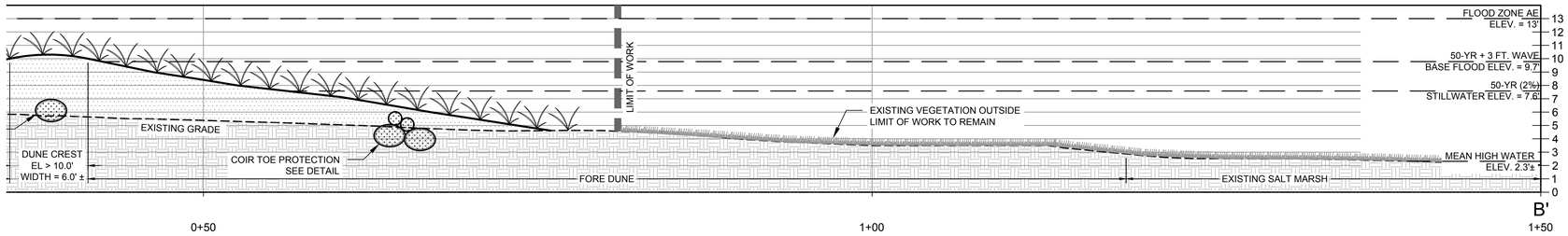
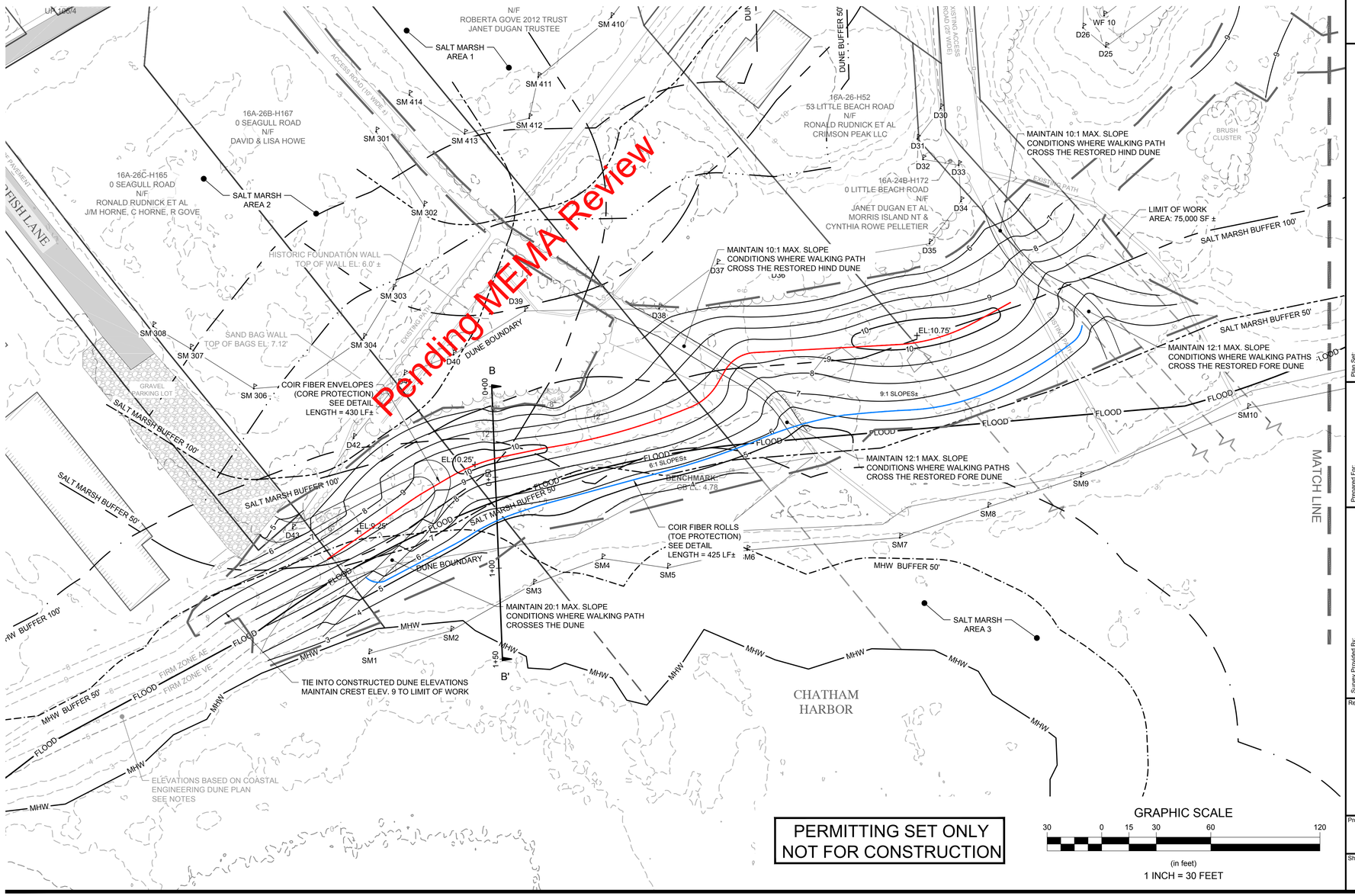


SECTION B-B' (CENTRAL)
HORIZONTAL SCALE: 1" = 5'
VERTICAL SCALE: 1" = 5'



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Plan Title: GRADING PLAN (CENTRAL)

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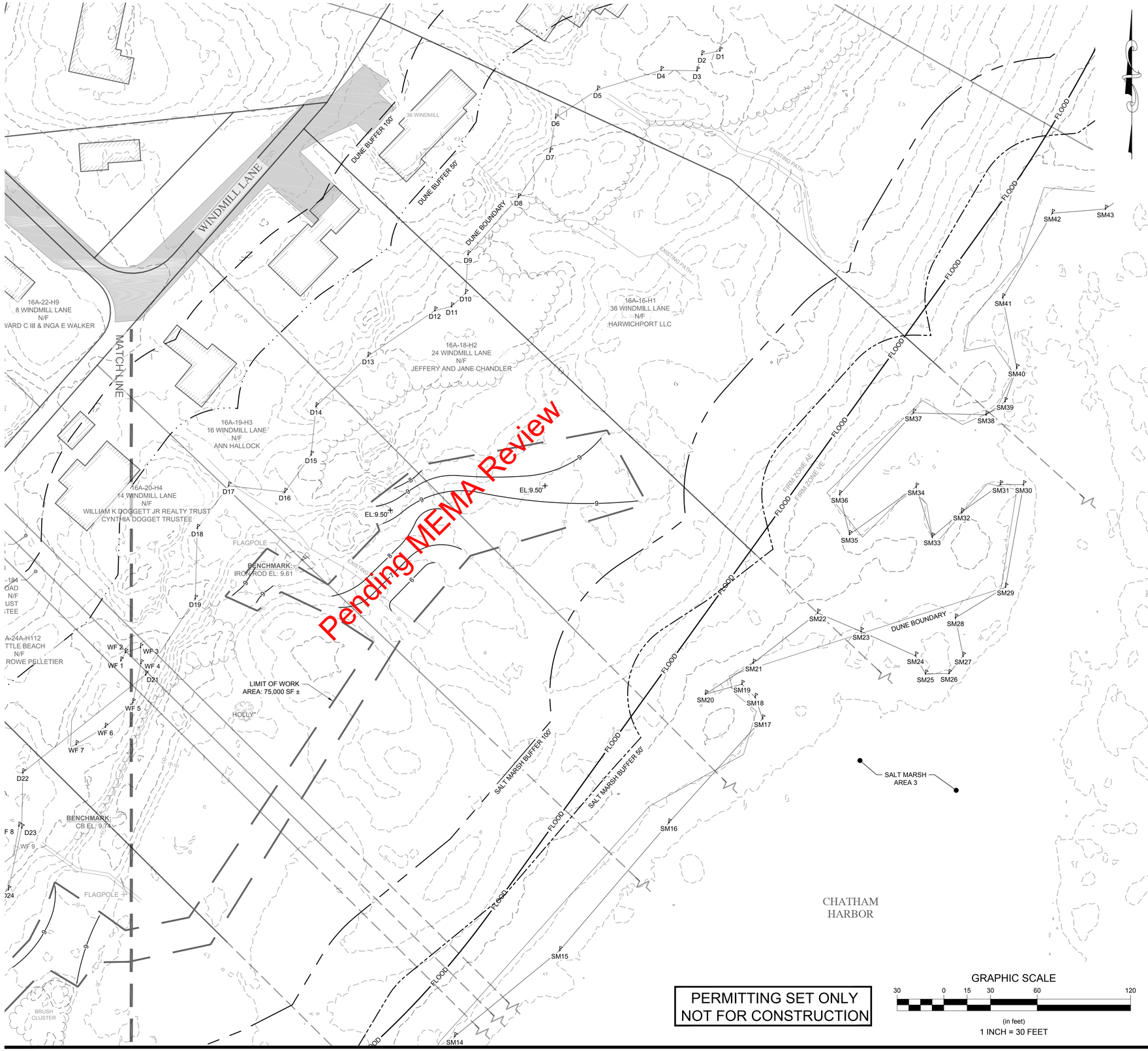
Project Number: 18169

Sheet : 10 of 15

Sheet Number: C - 10



GRAPHIC SCALE
30 0 15 30 60 120
(in feet)
1 INCH = 30 FEET

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DUNE STABILIZATION
CHATHAM, MASSACHUSETTS

Plan Title: GRADING PLAN (NORTH)

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Phone: (508) 833-4600
Fax: (508) 833-3150
Dated: FEBRUARY 2019

Registration:
DRAFT
NOT FOR CONSTRUCTION

Project Number: 18169
Sheet : 11 of 15

Sheet Number: C - 11

SUGGESTED DUNE PLANTINGS

Botanical Name	Common Name	Size	Spacing
Shrubs			
Myrica pensylvanica	Northern Bayberry	#3	5' O.C.
Prunus maritima	Beach Plum	#3	4' O.C.
Rosa virginiana	Virginia Rose	#3	5' O.C.
Ground Cover/Grasses/Perennials			
Ammophilia breviligulata	American Beach Grass	2" Plug	18" O.C.
Aster novae-angliae	New England Aster	2" Plug	24" O.C.
Lathyrus japonicus	Beach Pea	#1 gal.	24" O.C.
Panicum virgatum	Switchgrass	#1 gal.	36" O.C.
Parthenocissus quinquefolia	Virginina Creeper	#1 gal.	24" O.C.
Schizachyrium scoparium	Little Bluestem	#1 gal.	24" O.C.
Solidago sempervirens	Seaside Goldenrod	2" Plug	24" O.C.

GENERAL NOTES:

1. ALL TRANSPLANTED AND PROPOSED SHRUBS ARE TO BE FIELD LOCATED.
2. ALL DISTURBED AREAS NOT CALLED OUT TO BE PLANTED ARE TO BE SEEDED WITH MIX 1.
3. TEMPORARY SAND FENCING IS TO REMAIN AFTER THE COMPLETION OF CONSTRUCTION TO PROTECT THE SAND DUNES DURING THE ESTABLISHMENT PERIOD. THE MAINTAIN AND REMOVAL OF ALL SAND FENCING WILL BE CONDUCTED BY THE LITTLE BEACH ASSOCIATION.
4. SEE PLANTING NOTES & DETAILS ON SHEET L-16

GENERAL SEEDING NOTES:

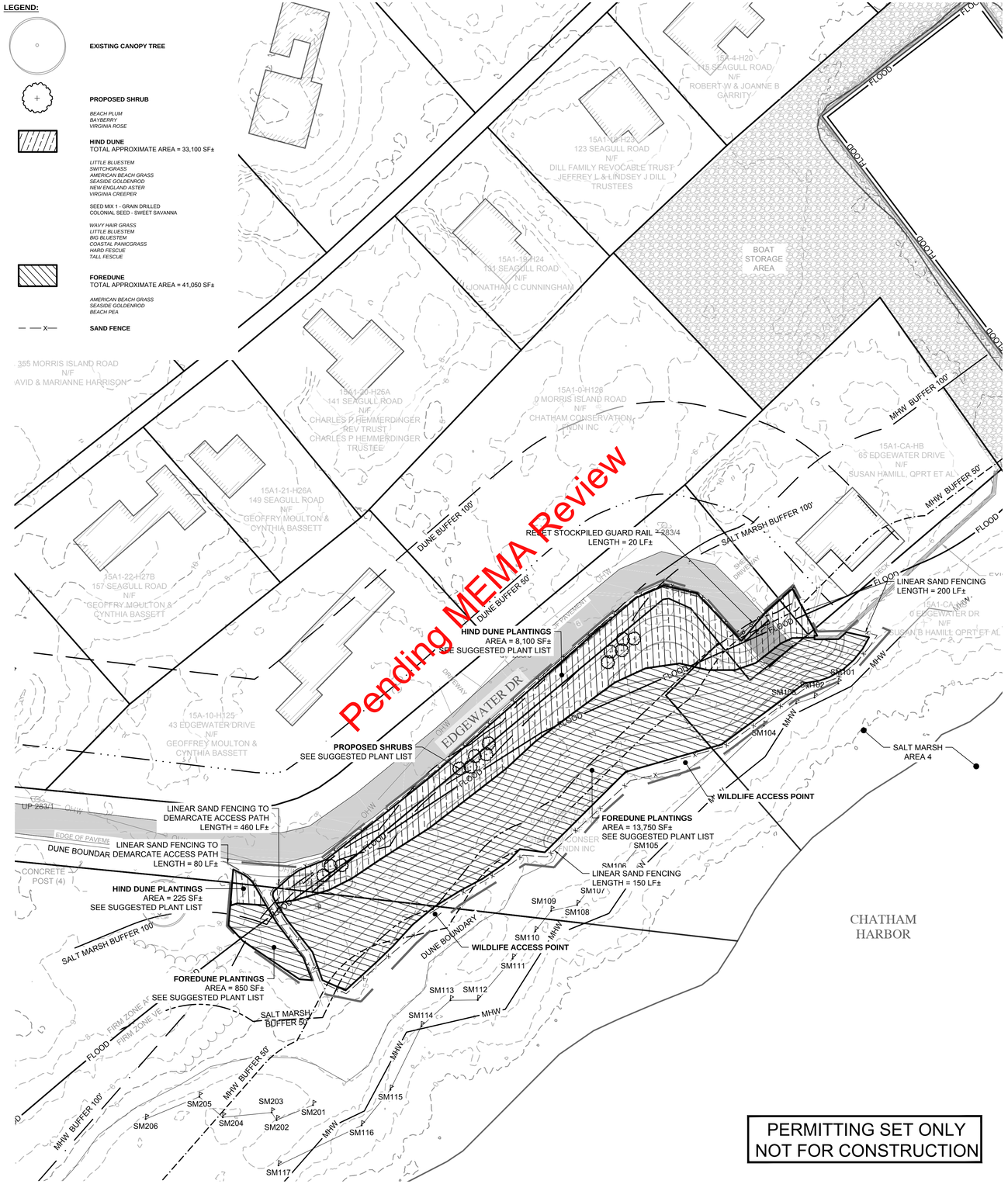
1. PRIOR TO THE PLACEMENT OF FILL MATERIALS, LOOSEN THE SUBGRADE OF ALL PROPOSED SEEDED AREAS TO A DEPTH OF 6" AND RAKE TO REMOVE STONES LARGER THAN 1 INCH, STICKS, ROOTS, RUBBISH AND OTHER EXTRANEOUS MATTER AND LEGALLY DISPOSE TO AN OFF-SITE LOCATION.
2. ALL AREAS THAT ARE DISTURBED AND/OR GRADED DURING CONSTRUCTION ARE TO BE BROUGHT TO FINISHED GRADE WITH AT LEAST 4" MINIMUM DEPTH OF GOOD QUALITY COURSE, WASHED SAND AND PLANTEDSEEDED AS SPECIFIED ON THE PLANS. ALL SEEDED AREAS ARE TO BE GRAIN DRILLED TO A DEPTH OF 2"±.

PLANTING LAYOUT NOTES

1. FOR ALL HATCHED AREAS - DO NOT PLANT LARGE AREAS OF THE SAME SPECIES. WITH THE EXCEPTION OF AMERICAN BEACH, PLANT THE SAME PLANT SPECIES IN GROUPS OF 3-7 AND NOT LARGER THAN 7.

Table 1. Area Calculations

Within 50 ft from the Resource Area (No Disturb Zone)	Existing (SF)	Proposed (SF)	Net Change (SF)	Proposed Mitigation (SF)
Area of structures	N/A	N/A	N/A	N/A
Area of hardscapes, pools, walkways, driveways, etc.	N/A	N/A	N/A	N/A
Within 50-100 ft of the Resource Area (the outer AURA)	**Existing (SF)**	**Proposed (SF)**	**Net Change (SF)**	**Proposed Mitigation (SF)**
Area of structures	N/A	N/A	N/A	N/A
Area of hardscapes, pools, walkways, driveways, etc.	N/A	N/A	N/A	N/A
Total Areas	0	0	0	0



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Schizachyrium scoparium	Little Bluestem	#1 gal.	24" O.C.
Solidago sempervirens	Seaside Goldenrod	2" Plug	24" O.C.

LEGEND:

EXISTING CANOPY TREE

PROPOSED SHRUB

BEACH PLUM
BAYBERRY
VIRGINIA ROSE

HIND DUNE
TOTAL APPROXIMATE AREA = 33,100 SF±

LITTLE BLUESTEM
SWITCHGRASS
AMERICAN BEACH GRASS
SEASIDE GOLDENROD
NEW ENGLAND ASTER
VIRGINIA CREEPER

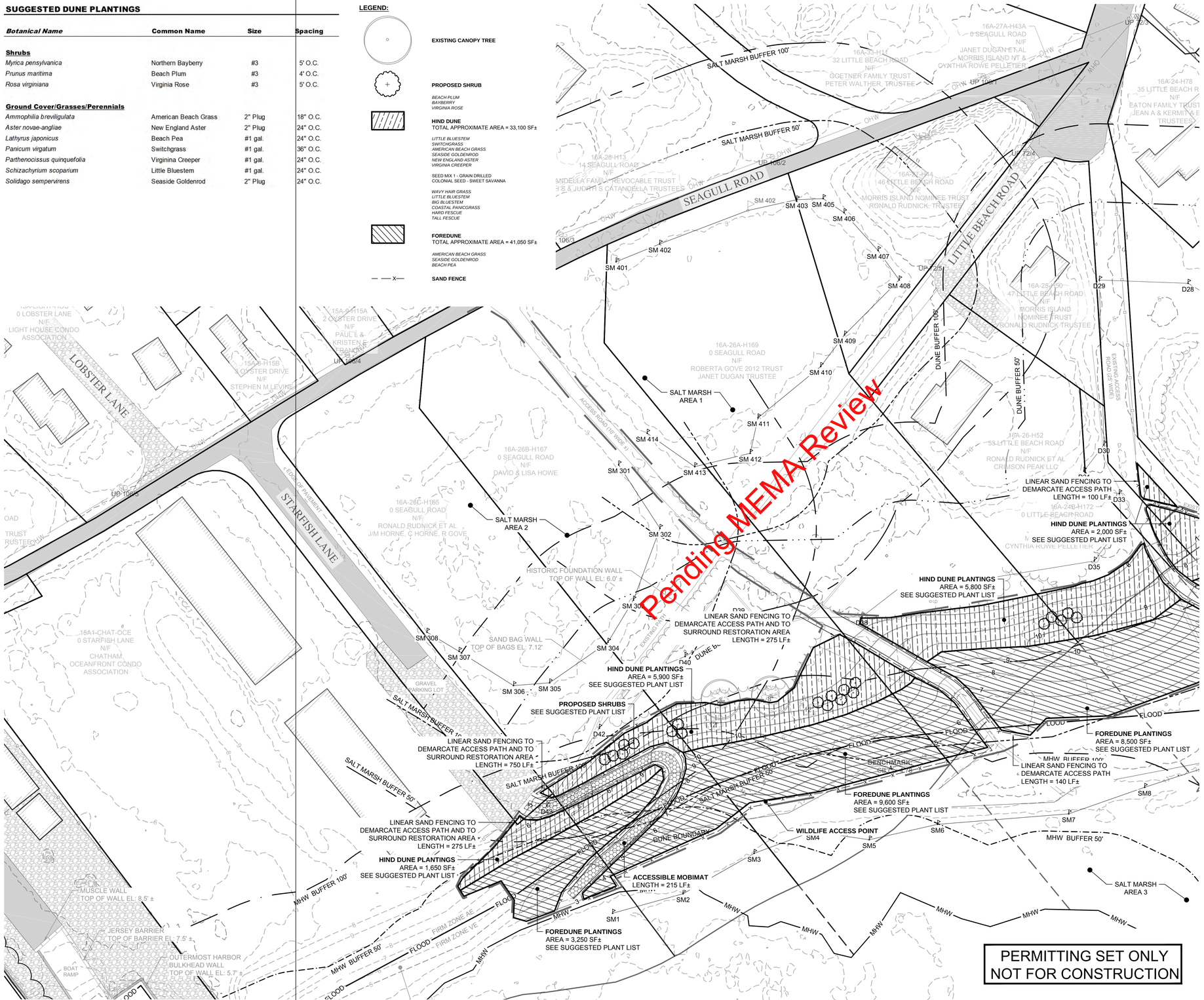
SEED MIX 1 - GRAIN DRILLED
COLONIAL SEED - SWEET SAVANNA

WAVY HAIR GRASS
LITTLE BLUESTEM
BIG BLUESTEM
COASTAL PANICGRASS
HARD FESCUE
TALL FESCUE

FOREDUNE
TOTAL APPROXIMATE AREA = 41,050 SF±

AMERICAN BEACH GRASS
SEASIDE GOLDENROD
BEACH PEA

SAND FENCE



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last modified: 03/22/19 printed: 03/22/19 by bl H:\Projects\2018\18169 Little Beach Assoc. Flood Resiliency\Drawings\18169 LA.dwg

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FOREDUNE
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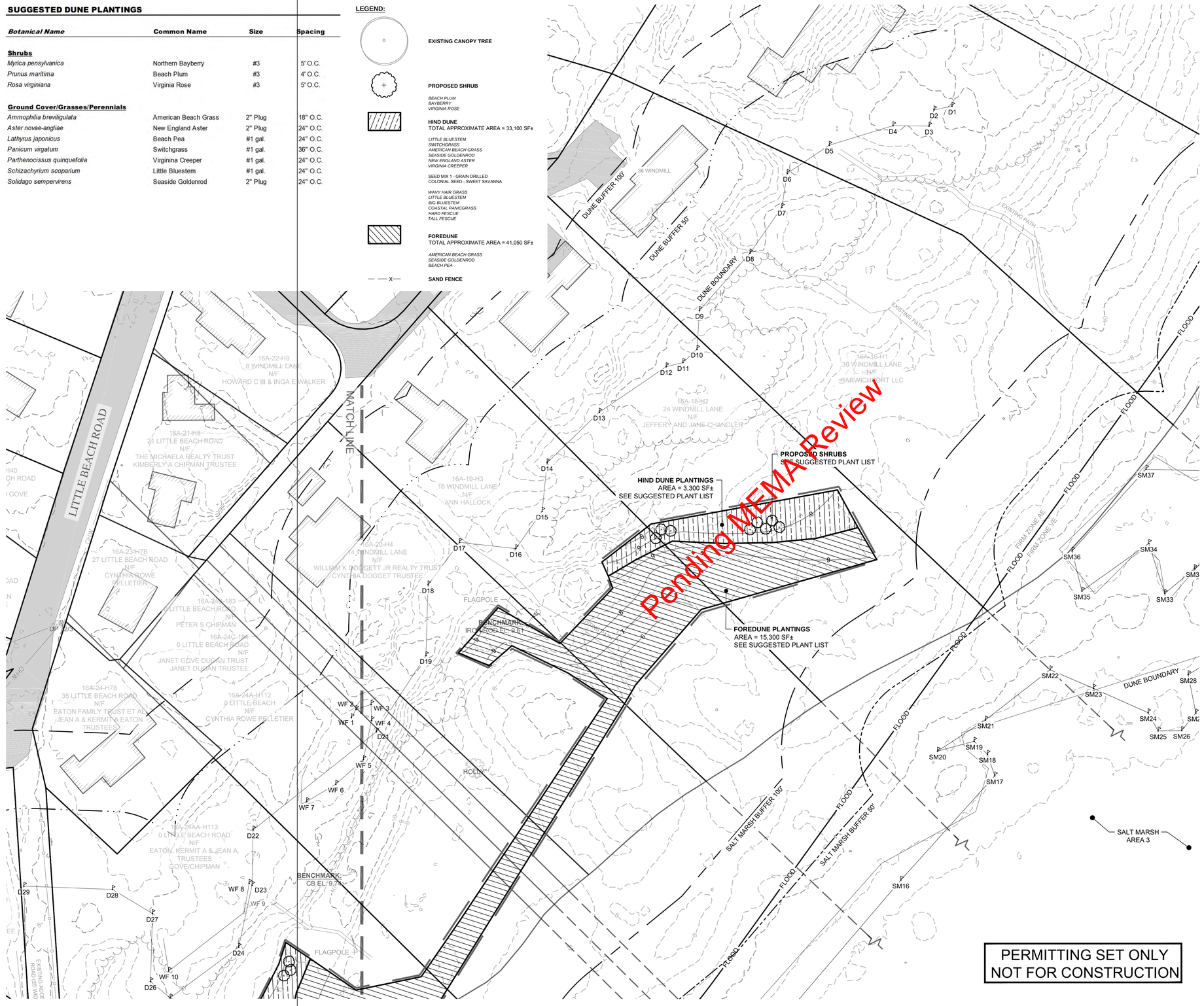
AMERICAN BEACH GRASS
SEASIDE GOLDENROD
BEACH PEA

SAND FENCE



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PLANTING NOTES:

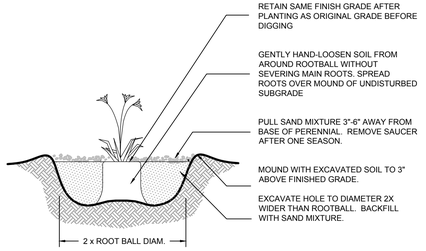
1. THE FOLLOWING NOTES ARE PROVIDED AS GENERAL PLANTING GUIDELINES ONLY. THOROUGHLY REVIEW THE PROJECT SPECIFICATIONS FOR ALL LANDSCAPE REQUIREMENTS PRIOR TO THE COMMENCEMENT OF ANY LANDSCAPE WORK. SUBMIT IN WRITING TO THE LANDSCAPE ARCHITECT ANY QUESTIONS OR CLARIFICATIONS REQUIRED AT A MINIMUM OF 30 DAYS PRIOR TO ORDERING ANY MATERIALS OR BEGINNING ANY LANDSCAPE CONSTRUCTION.
2. SUBMIT TO THE LANDSCAPE ARCHITECT FOR REVIEW AND APPROVAL ALL REQUIRED LANDSCAPE SUBMITTALS AS DESCRIBED IN THE SPECIFICATIONS INCLUDING A PLANT LIST WITH PLANT SIZE AND QUANTITIES TO BE ORDERED PRIOR TO DELIVERY TO THE PROJECT SITE.
3. FURNISH AND INSTALL ALL PLANTS AS SHOWN ON THE DRAWINGS AND IN THE SIZE AND QUANTITIES SPECIFIED ON THE PLANTING SCHEDULE. PLANT SUBSTITUTION SELECTION MUST BE APPROVED BY BIOLOGIST OR LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
4. ALL PLANTS TO COMPLY WITH APPLICABLE REQUIREMENTS OF ANSI Z60.1 "AMERICAN STANDARD FOR NURSERY STOCK." LATEST EDITION, PUBLISHED BY THE AMERICAN NURSERY AND LANDSCAPE ASSOCIATION INC.
5. PLANTS TO BE GROWN UNDER CLIMATIC CONDITIONS SIMILAR TO THOSE IN THE LOCALITY OF THE PROJECT FOR AT LEAST TWO (2) YEARS. USE HEALTHY NURSERY GROWN PLANTS, FREE OF DISEASE, INSECTS, AND PESTS. EGGS OR LARVAE, AND HAVE A WELL DEVELOPED ROOT SYSTEM.
6. INSTALL PLANTS WITHIN ONE (1) WEEK OF PURCHASE. IF PLANTS ARE TO BE STORED AT THE SITE PRIOR TO PLANTING, IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THEY ARE PROPERLY MAINTAINED, WATERED, AND REMAIN HEALTHY.
7. PROCEED WITH PLANTING ONLY WHEN EXISTING AND FORECASTED WEATHER CONDITIONS PERMIT. SUBMIT TO THE LANDSCAPE ARCHITECT IN WRITING THE PROPOSED PLANTING SCHEDULE. OBTAIN APPROVAL OF PLANTING SCHEDULE FROM THE LANDSCAPE ARCHITECT PRIOR TO PERFORMING ANY WORK.
8. SEASONS FOR PLANTING:

SPRING:	DECIDUOUS:	APRIL 1 TO JUNE 15
	EVERGREEN:	APRIL 1 TO JUNE 15
	PERENNIALS:	APRIL 15 TO JUNE 1
	GROUNDCOVERS:	APRIL 15 TO JUNE 1
FALL:	DECIDUOUS:	SEPTEMBER 15 TO NOVEMBER 15
	EVERGREEN:	SEPTEMBER 15 TO NOVEMBER 15
	PERENNIALS:	SEPTEMBER 15 TO NOVEMBER 15
	GROUNDCOVERS:	SEPTEMBER 15 TO NOVEMBER 15

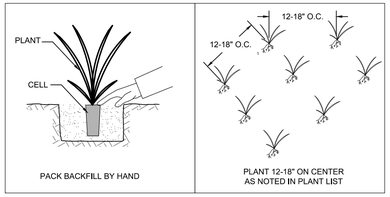
9. PLANTING UNDER FROZEN CONDITIONS IN EITHER THE SPRING OR FALL WILL NOT BE PERMITTED. PLANTING BEFORE OR AFTER THE ABOVE REFERENCED PLANTING DATES WILL INCREASE THE LIKELIHOOD OF PLANT OR GRASS SEED ESTABLISHMENT FAILURE. ANY DEVIATION FROM THE ABOVE REFERENCED PLANTING DATES IS UNDERTAKEN AT SOLE RISK OF THE CONTRACTOR AND IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE ANY ADDITIONAL MAINTENANCE AND WATERING WHICH MAY BE REQUIRED TO ENSURE SATISFACTORY PLANT AND SEED ESTABLISHMENT.
10. FURNISH ONE YEAR MANUFACTURER WARRANTY FOR TREES, PLANTS, AND GROUND COVER AGAINST DEFECTS INCLUDING DEATH AND UNSATISFACTORY GROWTH, EXCEPT FOR DEFECTS RESULTING FROM LACK OF ADEQUATE MAINTENANCE, NEGLECT, OR ABUSE BY OWNER, OR ABNORMAL WEATHER CONDITIONS UNUSUAL FOR WARRANTY PERIOD. THE DATE OF FINAL ACCEPTANCE OF ALL COMPLETED PLANTING WORK ESTABLISHES THE END OF INSTALLATION AND INITIAL MAINTENANCE PERIOD AND THE COMMENCEMENT OF THE GUARANTEE PERIOD.
11. INSPECT ALL AREAS TO BE PLANTED OR SEEDED PRIOR TO STARTING ANY LANDSCAPE WORK. REPORT ANY DEFECTS SUCH AS INCORRECT GRADING, INCORRECT SUBGRADE ELEVATIONS OR DRAINAGE PROBLEMS, ETC. TO THE LANDSCAPE ARCHITECT AND ENGINEER PRIOR TO BEGINNING WORK. COMMENCEMENT OF WORK INDICATES ACCEPTANCE OF SUBGRADE AREAS TO BE PLANTED, AND THE LANDSCAPE CONTRACTOR ASSUMES RESPONSIBILITY FOR ALL LANDSCAPE WORK.
12. PROVIDE PROPER PREPARATION OF ALL PROPOSED PLANTED AND SEEDED AREAS PER THE NOTES AND SPECIFICATIONS.
13. ALL PLANT LAYOUT AND ACTUAL PLANTING LOCATIONS ARE TO BE FIELD VERIFIED BY LANDSCAPE ARCHITECT PRIOR TO PLANTING. NOTIFY THE LANDSCAPE ARCHITECT AT A MINIMUM OF 48 HOURS IN ADVANCE PRIOR TO SCHEDULING ANY FIELD INSPECTIONS.
14. BALL AND BURLAP: REMOVE BURLAP AND WIRE BASKETS FROM TOPS OF BALLS AND FROM TOP HALF OF ROOTBALL AS INDICATED ON DRAWINGS. REMOVE PALLETS, IF ANY, BEFORE SETTING.
15. POTTED PLANTS: REMOVE THE PLANT FROM THE POT AND LOOSEN OR SCORE THE ROOTS BEFORE PLANTING TO PROMOTE OUTWARDS ROOT GROWTH INTO THE SOIL.
16. PLUGS: PLANT UPRIGHT AND NOT AT AN ANGLE. DIG PLANTING HOLES LARGE ENOUGH AND DEEP ENOUGH TO ACCOMMODATE THE ENTIRE ROOT MASS. PLANT PLUGS WITH NO TWISTED OR BALLED ROOTS AND WITH NO ROOTS EXPOSED ABOVE THE GRADE LINE. HAND PACK THE SOIL AROUND THE ENTIRE PLUG ROOT MASS.
17. DIG THE THE PLANTING HOLE TO THE SAME DEPTH AS THE ROOT BALL AND TWO TO THREE TIMES WIDER. SCORE ALL SIDES OF THE HOLE, PLACE THE PLANT IN THE HOLE SO THE TOP OF ROOT BALL IS EVEN WITH SOIL SURFACE. FILL THE HOLE HALFWAY AND THEN ADD WATER ALLOWING IT TO SEEP INTO BACK FILLED MATERIAL. BE SURE TO REMOVE ALL AIR POCKETS FROM BACK FILLED SOIL. DO NOT SPREAD SOIL ON TOP OF THE ROOTBALL. IF SOIL IS EXTREMELY POOR, REPLACE BACK FILL WITH GOOD QUALITY TOP SOIL. AMEND THE SOIL, AS NECESSARY.
18. CREATE A 2" TO 4" BERM AROUND THE EDGE OF PLANTING HOLE WITH REMAINING SOIL TO RETAIN WATER.
19. REMOVE ALL PLANT TAGS AND FLAGS FROM THE PLANTS.
20. MULCH ALL PLANTING BEDS AS INDICATED ON DRAWINGS. UNLESS NOTED OTHERWISE, ALL PLANTS TO RECEIVE 2-3 INCHES OF MULCH. DO NOT PILE OR MOUND MULCH AROUND THE PLANT STEMS OR TRUNK.
21. TRIM BROKEN AND DEAD BRANCHES FROM SHRUBS AFTER PLANTING. NEVER CUT A LEADER.

WATERING NOTES:

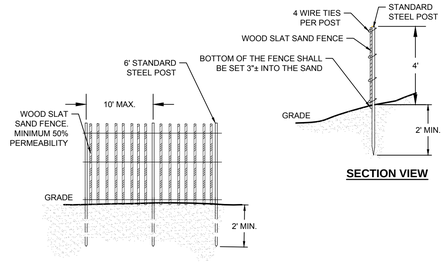
1. PROVIDE PROPER PLANT CARE, MAINTENANCE AND WATERING ON SITE UNTIL SUCH TIME AS THE LANDSCAPING IS ACCEPTED BY THE PROPERTY OWNER AS SATISFACTORY PER THE SPECIFICATIONS OR AS DETERMINED BY ANY WRITTEN AGREEMENTS BETWEEN THE CONTRACTOR AND PROPERTY OWNER.
2. ESTABLISH AN APPROPRIATE WATERING SCHEDULE FOR ALL PLANT MATERIAL BASED UPON PLANT SPECIES REQUIREMENTS AND PROVIDE IN WRITING TO THE LANDSCAPE ARCHITECT AND OWNER FOR REVIEW AND APPROVAL. ADHERE TO THE APPROVED SCHEDULE UNTIL PLANTS ARE FULLY ESTABLISHED.
3. AT A MINIMUM THE NEWLY SEEDED AND/OR HYDROSEEDED LAWNS SHOULD BE WATERED DAILY DURING DROUGHT CONDITIONS. SPECIAL CARE SHOULD BE TAKEN TO ENSURE THAT THE LAWN IS NOT SATURATED DURING WATERING. IF AN IRRIGATION SYSTEM IS NOT PROVIDED, A TEMPORARY IRRIGATION SYSTEM OR HANDHELD GARDEN HOSE SHALL BE USED FOR WATERING SEEDED AREAS. THE AREA MUST BE MAINTAINED CONSISTENTLY MOIST FOR THE BEST GERMINATION RESULTS. ADDITIONAL WATERING WILL BE REQUIRED IF PLANTING AND SEEDING OCCUR OUTSIDE OF THE RECOMMENDED PLANTING SEASONS.



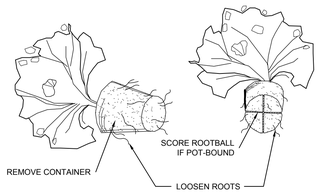
PERENNIAL PLANTING
NOT TO SCALE



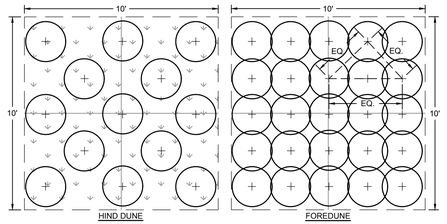
PLUG PLANTING & SPACING
NOT TO SCALE



SAND FENCE
NOT TO SCALE

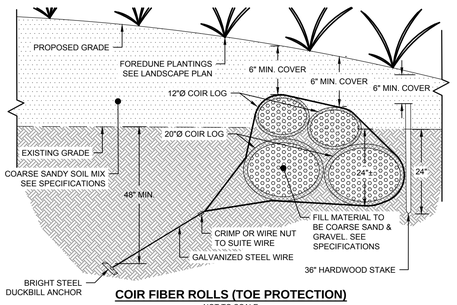


CONTAINER PLANT ROOTBALL TREATMENT
NOT TO SCALE



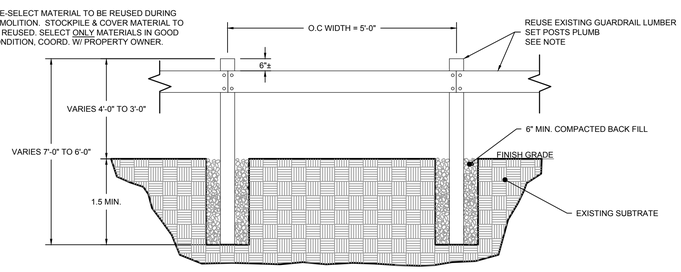
NOTES:
1. USE EQUIDISTANT TRIANGULAR SPACING FOR SIMILAR PLANT SPECIES.
2. SEE LANDSCAPE PLANS FOR ON CENTER SPACING REQUIREMENTS.
3. SEEDING TO BE ON HIND DUNE ONLY.

PLANT SPACING
NOT TO SCALE



COIR FIBER ROLLS (TOE PROTECTION)
NOT TO SCALE

NOTE:
1. PRE-SELECT MATERIAL TO BE REUSED DURING DEMOLITION. STOCKPILE & COVER MATERIAL TO BE REUSED. SELECT ONLY MATERIALS IN GOOD CONDITION, COORD. W/ PROPERTY OWNER.



WOODEN GUARDRAIL (RESET)
NOT TO SCALE

last modified: 03/22/19 printed: 03/22/19 by bl H:\Projects\2018\18169 Little Beach Assoc. Flood Resiliency\Drawings\18169 LA.dwg

EXHIBIT C: WORK SCHEDULE

The schedule needs to avoid disruption of summer activities at the marina and stabilize the dunes at a time where the plantings can take hold and thrive.

The three major construction events are:

- The construction of the bulkhead modifications and replacement of the Hamill wall;
- The stabilization of the dunes from the sharp corner of Edgewater Drive to the Hamill retaining wall, the construction of the dunes crossing the marina property including connections to hard structures and the reconstruction of the dune that was started in front of the Oceanfront condominiums but requires reinforcement and planting; and
- The stabilization of the dunes northeast of the Condo dunes and southwest of the Hamill wall.

The enclosed schedules are separated into these major events. It is noted that stabilization of the dunes in 2020 will overlap on-going work at the marina but no conflict between the contractors is expected and will be specifically guarded against by the general conditions of the contracts.

Timeline for Construction of Work at the OHM and the Hamill Property:

This includes site work, raising the bulkheads, and replacing the Hamill retaining wall. The construction of the reinforced dune at the end of the Hamill wall and the OHM. The connection from the marina and the Oceanfront Condominiums will be included in the first year of dune construction.

Bulkhead and Retaining Walls with Incidental Work at OHM	
Activity	**Duration**
Permitting	12 months
Prepare Contract Documents, Bidding and Contract Award	4 months
Mobilization, Removals and Demolition, and Site Preparation	1 month
Install new Structural supports on Bulkheads	2 months
Raise Elevation of Bulkheads	3 months
Construct new Retaining Wall on Hamill Property	2 months
Prepare area for dune construction (by others)	2 months
Replace or reinstall removed item/sand final restoration	2 months
Contract Administration	14 months

Timeline for Construction of the Northeast and Southwest Dunes:

This contract will include stabilization of existing dunes northeast of the Condo dunes and southwest of the Hamill wall.

Year 1 Dune Construction	
Activity	**Duration**
Permitting	2 months
Prepare Contract Documents, Bidding and Contract Award	2 months
Mobilization, Removals and Demolition, and Site Preparation	1 month
Construct Dunes of Sand and Stabilization materials	2 months
Dune Planting	1 months
Punchlist and Project Closeout	1months
Administrative	8 months
Year 2 Dune Monitoring	
Prepare Contract Documents, Bidding and Contract Award	*2 months*
Observe and Document Vegetation Growth and Cover	*6 months*
Replace Dune Plantings as Needed	*1 months*
Administrative	*8 months*

Timeline for Construction of the Westerly Dunes and Reconstruction of Oceanfront Dune:

This contract will include the construction of reinforced dunes near the marina and the reconstruction of the dunes in front of the Oceanfront Condominiums.

Year 1 Dune Construction	
Activity	**Duration**
Permitting	2 months
Prepare Contract Documents, Bidding and Contract Award	2 months
Mobilization, Removals and Demolition, and Site Preparation	1 month
Construct Dunes of Sand and Stabilization materials	2 months
Dune Planting	2 months
Punchlist and Project Closeout	2months
Administrative	8 months
Year 2 Dune Construction	
Prepare Contract Documents, Bidding and Contract Award	*4 months*
Mobilization, Removals and Demolition, and Site Preparation	*1 month*
Construct Dunes of Sand and Stabilization materials	*2 months*
Dune Planting	*2 months*
Punchlist and Project Closeout	*2months*
Administrative	*8 months*

EXIBIT D: PROJECT COST ESTIMATE WORKSHEET

Please attach additional documentation or your own cost shares for more detail.

Name of Sub-Recipient							Grant Program			
Chatham							**HMGP-4372/HMGP-4379**			
CFDA #		Federal Identification Number	Budget (Check One)		Budget Period				Strategic Funds Management	
		046-001-110	New _X_	Revised ___	From:	06/19	To:	12/22	Yes _____	No __X____
FEMA Ob#	Task	Activity/Cost Classification	A. Eligible and Approved Total Cost			B. Local Share*			C. Federal Share**	
	1	Permitting & Engineering design	287,487			171,055			116,432	
	2	Construction	2,063,924			1,228,035			835,889	
	3									
	4	Contingency – 5%	117,571			69,954			47,616	
Subtotal			$2,468,982			$1,469,044			$999,938	
Project (Program) income										
Total			$2,468,982			$1,469,044			$999,938	

* Local Share, per regulation, is at most 25% of total eligible and approved costs ** Federal share, per regulation, is at least 75% of total eligible and approved costs

* Local Share in-hand includes LBA donation of $4,600 to Town for MEMA grant application services. LBA also hired HW to permit and design NE and SW dunes for $19,750.

Please provide a dollar amount that you anticipate spending in each fiscal year listed below for the federal funds only

		FY 19	0	FY 20	550,000	FY 21	449,938	FY22	

For Strategic Funds Management, the Federal Funds obligations will be broken down by tasks and duration of the tasks.

Mitigation Project Milestone Work Schedule

Ob#	FEMA Amendment #	Duration (Months)	Federal Share Amount	Date of obligation	Contract end

EXHIBIT E: ENVIRONMENTAL COMPLIANCE INFORMATION

"Yes" indicates that the environmental regulation or statute may apply to your project. Write the word "yes" or "no" in the Yes/No column. If unknown, write "unknown" in comments section. Please provide relevant information and/or documentation to support your answers. This list is not all-inclusive.

Environmental Regulation or Statute		Yes	No	Comments
National Historic Preservation Act (NHPA)				
1.A	Would the proposed project affect, or is the proposed project in close proximity to, any buildings or structures 50 years or more in age?		X	The shorefront properties contain some homes that are likely 50 years old, but the project will not affect these.
1.B	Will the proposed project involve disturbance of ground? If yes, provide approximate SF/LF and approximate depth, and provide past use.	X		The proposed project will involve disturbance of ground.
1.C	Will the proposed project affect or involve removal of any vegetation?	X		Some vegetation will need to be removed. Plants in good condition will be set aside and replanted upon dune completion.
Endangered Species Act (ESA)				
2.A	Are federally listed or endangered species, or their critical habitat, present in or near the project area and, if so, which species are present?	X		According to the IPaC the following species are potentially in this location: Roseate Tern, Piping Plover, Red Knot and Northern long-eared bat. However no critical habitats are at this location.
2.B	Will the proposed project remove or affect vegetation?	X		Some vegetation will need to be removed. Plants in good condition will be set aside and replanted upon dune completion. Native vegetation will be planted to stabilize the dune and provide additional habitat.
2.C	Is the proposed project in or near (within 200 feet), or likely to affect, any type of waterbody or body of water?	X		The project is within 200 feet of a waterbody, upland of the MHW.
Clean Water Act (CWA) and Rivers and Harbors Act				
3.A	Will the proposed project involve dredging or disposal of dredged material,		X	The project will not involve dredging but may use dredge

	excavation, the addition of fill material, or result in any modification to water bodies or wetlands designated as "waters of the United States" as identified by the U.S. Army Corps of Engineers or on the National Wetland Inventory?			material if it is available. During review by the Chatham Conservation Commission the applicant will request the approval of the conservation commission to use dredge materials from other projects or upland sources. Dredging is not part of the proposed project
Executive Order 11988 (Protection of Floodplains) and Executive Order 11990 (Protection of Wetlands)				
(note: see additional floodplain/FIRM questions immediately following this chart)				
4.A	Does a Flood Insurance Rate Map, Flood Hazard Boundary Map, hydrological study, or some other source indicate that the project is located in, or will affect, a 100-year floodplain, a 500-year floodplain (if a critical action), an identified regulatory floodway, or an area prone to flooding?	X		The project is located within the 100-year floodplain. See attached Figure 3.
4.B	Is the proposed project located in, or will it affect, a wetland as listed in the National Wetland Inventory?		X	
4.C	Will the proposed project alter a watercourse, waterway, body of water, water flow patterns, or a drainage way regardless of its floodplain designation?	X		The project is designed to protect inland parcels in the Little Beach Area from coastal storm surge, to reduce the frequency of and damage from flooding.
Environmental Regulation or Statute		**Yes**	**No**	**Comments**
4.D	Is the proposed project located in, or will it affect, a floodplain or wetland? If yes, the 8-step process summarized in HMA Job Aids must be completed.	X		See attached.
4.E	Is the Community participating in the NFIP? If "Yes" provide the NFIP Community ID # (FEMA-CID code) and Date	X		
	Is there a Flood Insurance Study (FIS) available for your community?	X		
	Is the project located in a Special Flood Hazard Area (SFHA)?	X		

Coastal Zone Management Act (CZMA) and Coastal Barrier Resources Act (CBRA)				
5.A	Is the proposed project located in the State's designated coastal zone?	X		
5.B	Is the proposed project located in a Coastal Barrier Resources System Unit or Otherwise Protected Area?	X		Portions of the project are located within a CBRS Unit or Otherwise Protected Area
Farmland Protection Policy Act (FPPA)				
6.A	Will the proposed project convert more than 5 acres of "prime or unique" farmland outside city limits to a non-agricultural use?		X	
Resource Conservation Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act				
7.A	Is there reason to suspect there are contaminants from a current or past use on the property associated with the proposed project?		X	
7.B	Are there are any studies, investigations, or enforcement actions related to the property associated with the proposed project?		X	
7.C	Will any project construction or operation activities involve the use of hazardous or toxic materials?		X	
7.D	Are any of the current or past land uses of the property associated with the proposed project or are any of the adjacent properties associated with hazardous or toxic materials?		X	
Executive Order 12898 (Environmental Justice for Low Income and Minority Populations)				
8.A	Are there any low-income or minority populations in the project's area of effect or adjacent to the project area?		X	See attached MassGIS map.
Massachusetts Environmental Policy Act (MEPA)				
9.A	Does your proposed project meet or exceed any Massachusetts Environmental Policy Act (MEPA) thresholds for preparation of an Environmental Notification Form (ENF), or mandatory Environmental Impact Report (EIR)?		X	

Other Environmental/Historic Preservation Laws (including applicable State laws) or Issues				
10. A	Are other environmental/historic preservation requirements associated with this project?		X	
Environmental Regulation or Statute		**Yes**	**No**	**Comments**
10. B	Are any controversial issues associated with this project?		X	
10. C	Have any public meetings been conducted, public notices been circulated, or public comments been solicited on the proposed project?	X		
10. D	Is the waterway designated under the National Wild and Scenic Rivers Act?		X	
10. E	Is the project located in (or adjacent to) an Area of Critical Environmental Concern (ACEC)?		X	
Miscellaneous				
11. A	Please identify the environmental permits anticipated for project implementation (local Conservation Commission approval, Army Corps of Engineers, Chapter 91, etc.)	X		The project will require approval from the Chatham Conservation Commission.

Additional Floodplain/FIRM Information:

Based on the FIRM, indicate the flood zone(s) of the project site(s) (e.g., A10, C, AE, V): AE (13 ft) & VE (el 15 ft)

100-Year (base) flood elevation at the site is 13 Ft.

NGVD 29 (MSL)_____ NAVD 88 X Other (i.e. local) _____

Source of 100-year (base) flood elevation FEMA's National Flood Hazard Layer Community Map # 250004 (effective 07/16/2014)

Local Floodplain Administrator consulted? Yes X No ____ Unknown

Floodplain Consultation Date: April 1, 2019

Local Floodplain Administrator Name: Jay Briggs

Phone: 508-945-5160

Floodplain Consultation Comments: None.

EXHIBIT F: COST BENEFIT ANALYSIS
See attached.

EXHIBIT G: ELEVATION AND ACQUISITION DOCUMENTATION PACKAGE
Not applicable to this project.

EXHIBIT K

General Conditions

The undersigned submits this Sub-Application under the Federal Emergency Management Agency's **Hazard Mitigation Grant Program (HMGP)**, and does hereby certify that the Sub-Applicant will fulfill all requirements of the program.

The undersigned acknowledges that actions initiated and or completed without fulfilling the specific documentation and procedural requirements of the National Environmental Policy Act (NEPA) may not be considered for FEMA funding. Only in rare situations, where actions were initiated in an emergency situation to prevent or reduce an immediate threat to life, health, property or severe economic losses can exceptions be considered, if otherwise eligible. However, no project Sub-Application can be considered for FEMA funding if the project was initiated prior to the receipt of this Sub-Application from the Massachusetts Emergency Management Agency (MEMA).

The undersigned acknowledges that to retain eligibility for funding, the Sub-Applicant may not initiate work on this project prior to FEMA approval. Furthermore, that as a condition of any project approval, the Sub-Applicant acknowledges that they are responsible for obtaining all required permits and approvals (federal, state & local) prior to project initiation, including but not limited to obtaining easements, right-of-way access, etc. necessary for project implementation and long-term maintenance of the proposed mitigation activity. Copies of all permits are to be forwarded to MEMA prior to project construction. Any modifications to the approved scope of work must be submitted to MEMA/DCR and FEMA for approval. All site inspections and maintenance should be documented and maintained by the Sub-Applicant, since this would be essential in determining the eligibility of federal funding for future damages arising at the sites.

The undersigned acknowledges that other types of federal assistance that have been received for this project have been identified within this Sub-Application. In addition, all requests or anticipated requests for funding made to other federal agencies or sources are also identified within this Sub-Application.

Signature Jill N. Gr _____ Date April 3, 2019_____

Printed Name Jill R. Goldsmith _____

Title Town Manager_____

EXHIBIT L

Funding Commitment

FEMA administers cost-sharing requirements consistent with 2 CFR Sections 200.29, 200.306, and 200.434. To meet cost-sharing requirements, the non-Federal contributions must be verifiable from the sub-recipient's records, reasonable, allowable, allocable, and necessary under the grant program and must comply with all Federal requirements and regulations (2015 HMA Guidance, Part II, Section C. Cost Sharing).

I hereby certify that the 25% local share of this project:

_____Is available

The individual homeowner/property owner(s) will provide the local match in its entirety (Please include documentation from the homeowner(s) committing to the non-federal share and any ongoing or necessary maintenance.)

_____Will be available within 3 months of submitting this project Sub-Application

_____Will be available within __9_____ months of submitting this project Sub-Application and will require the following action by the Sub-Applicant:

See attached letter from Little Beach Association. The Chatham Board of Selectmen will hold a review of the Towns participation in overall project costs on Monday, April 8, 2019.

Describe the source of local share:

I certify that local match funding will be committed and available from the *City/Town/Sub-applicant*

Town of Chatham, Commonwealth of Massachusetts.

Signature _____ Date April 3, 2019

Printed Name Jill R. Goldsmith

Title Town Manager

Little Beach Association, Inc.
P.O. Box 668
Chatham, MA. 02633

EXHIBIT L

FUNDING COMMITMENT

FEMA administrators cost-sharing requirements consistent with 2 CFR Sections 200.29, 200.306, and 200.434. To meet cost-sharing requirements, the non-Federal contributions must be verifiable from the sub-recipient's records, reasonable, allowable, and necessary under the grant program and must comply with all Federal requirements and regulations (2015 HMA Guidance, Part II, Section C. Cost Sharing).

I hereby certify that the 25% of the scope of this project will be provided by the individual homeowners, property owners, the owner(s) of the Outermost Harbor Marina (OHM), and the Little Beach Association. We will also provide for the necessary maintenance of the dunes and improvements that are the infrastructure that will be funded by this grant.

This 25% match will be available within eight (8) months of submitting this project Sub-Application and will require the following action by the Sub-Applicant:

We will continue our fundraising program, pursue other non-Federal grant applications, and other sources of funding until we raise the 25% local share.

The members of the Little Beach Association (LBA) have already raised $19,750 to pay for the engineering plans completed by Horsley Witten Engineering, $4,600 to pay to the Town of Chatham for the cost / benefit analysis, and $5,000 to pay for engineering plans by Fairhaven Engineering Corp.

The sources of the local share will be the residents of the Little Beach Association, the OHM, residents of the Morris Island neighborhood and the Stage Island neighborhood, the Monomoy National Wildlife Refuge, and non-federal grant programs.

I certify that the local match finding will be committed and available from the LBA, Chatham, Commonwealth of Massachusetts.

Signature Jeff Dill Date: April 3, 2019

Printed Name: Jeffrey Dill

Title: Executive Director, Little Beach Association

EXHIBIT M

Maintenance Agreement

The *City/Town/Sub-applicant* Town of Chatham, Commonwealth of Massachusetts, hereby agrees that if it receives any Federal aid as a result of the attached project Sub-Application, it will accept responsibility, at its own expense if necessary, for the routine maintenance of any real property, structures, or facilities acquired or constructed as a result of such Federal aid. Routine maintenance shall include, but not be limited to, such responsibilities as keeping vacant land clear of debris, garbage, and vermin; keeping stream channels, culverts, and storm drains clear of obstructions and debris; and keeping detention ponds free of debris, trees, and woody growth.

The purpose of this agreement is to make clear the Sub-recipient's maintenance responsibilities following project award and to show the Sub- recipient's acceptance of these responsibilities. It does not replace, supersede, or add to any other maintenance responsibilities imposed by any Federal law or regulation and which are in force on the date of project award.

Annual inspections should be documented and maintained by the Sub- recipient, since this would be essential in determining the eligibility of Federal funding for future damages arising at the project site.

To the best of my knowledge and belief, all information that is submitted within this Sub-Application is true and correct. I represent this Sub-Applicant and am authorized by the governing body of this jurisdiction to commit the local matching share.

Signature Jill R. Goldsmith Date April 3, 2019

Printed Name Jill R. Goldsmith

Title Town Manager

See attached letter from Little Beach Association.

Little Beach Association, Inc.
P.O. Box 668
Chatham, MA. 02633

EXHIBIT M

Maintenance Agreement

The Little Beach Association (LBA) and The Outermost Harbor Marina (OHM), Commonwealth of Massachusetts, hereby agrees that if it receives any Federal aid as a result of the attached project Sub-Application, it will accept responsibility, at its own expense if necessary, for the routine maintenance of any real property, structures or facilities acquired or constructed as a result of such Federal aid. Routine maintenance shall include but not be limited to, such responsibilities as keeping vacant land clear of debris, garbage, and vermin; keeping stream channels, culverts, and storm drains clear of obstructions and debris; and keeping detention ponds free of debris, trees, and woody growth.

The purpose of this agreement is to make clear the Sub-recipient's maintenance responsibilities following project award and to show the Sub-recipient's acceptance of these responsibilities. It does not replace, supersede, or add to any other maintenance responsibilities imposed by any Federal law or regulation and which are in force on the date of project award.

To the best of my knowledge and belief, all information that is submitted within this Sub-Application is true and correct. I represent this Sub-Applicant and am authorized by the governing body of this jurisdiction to commit the local matching share.

Signature _____

Printed Name: Jeffery Dill

Title: Executive Director, Little Beach Association

Date: April 3, 2019

Issued May 2004

COMMONWEALTH OF MASSACHUSETTS
CONTRACTOR AUTHORIZED SIGNATORY LISTING

CONTRACTOR LEGAL NAME :
CONTRACTOR VENDOR/CUSTOMER CODE:

INSTRUCTIONS: Any Contractor (other than a sole-proprietor or an individual contractor) must provide a listing of individuals who are authorized as legal representatives of the Contractor who can sign contracts and other legally binding documents related to the contract on the Contractor's behalf. In addition to this listing, any state department may require additional proof of authority to sign contracts on behalf of the Contractor, or proof of authenticity of signature (a notarized ature that the Department can use to verify that the signature and date that appear on the Contract or other legal document was actually made by the Contractor's authorized signatory, and not by a representative, designee or other individual.)

NOTICE: ***Acceptance of any payment under a Contract or Grant shall operate as a waiver of any defense by the Contractor challenging the existence of a valid Contract due to an alleged lack of actual authority to execute the document by the signatory.***

For privacy purposes **DO NOT ATTACH** any documentation containing personal information, such as bank account numbers, social security numbers, driver's licenses, home addresses, social security cards or any other personally identifiable information that you do not want released as part of a public record. The Commonwealth reserves the right to publish the names and titles of authorized signatories of contractors.

AUTHORIZED SIGNATORY NAME	TITLE
Jill R. Goldsmith	Town Manager

I certify that I am the President, Chief Executive Officer, Chief Fiscal Officer, Corporate Clerk or Legal Counsel for the Contractor and as an authorized officer of the Contractor I certify that the names of the individuals identified on this listing are current as of the date of execution below and that these individuals are authorized to sign contracts and other legally binding documents related to contracts with the Commonwealth of Massachusetts on behalf of the Contractor. I understand and agree that the Contractor has a duty to ensure that this listing is immediately updated and communicated to any state department with which the Contractor does business whenever the authorized signatories above retire, are otherwise terminated from the Contractor's employ, have their responsibilities changed resulting in their no longer being authorized to sign contracts with the Commonwealth or whenever new signatories are designated.

Jill R. Gold

Signature

April 3, 2019
Date

Town Manager
Title

508-945-5105
Telephone

508-945-3550
Fax

jgoldsmith@chatham-ma.gov
Email

ASSURANCES - CONSTRUCTION PROGRAMS

OMB Number: 4040-0009
Expiration Date: 06/30/2014

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0042), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the Awarding Agency. Further, certain Federal assistance awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant:, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance, and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project costs) to ensure proper planning, management and completion of project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, the right to examine all records, books, papers, or documents related to the assistance; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will not dispose of, modify the use of, or change the terms of the real property title or other interest in the site and facilities without permission and instructions from the awarding agency. Will record the Federal awarding agency directives and will include a covenant in the title of real property acquired in whole or in part with Federal assistance funds to assure non-discrimination during the useful life of the project.
4. Will comply with the requirements of the assistance awarding agency with regard to the drafting, review and approval of construction plans and specifications.
5. Will provide and maintain competent and adequate engineering supervision at the construction site to ensure that the complete work conforms with the approved plans and specifications and will furnish progressive reports and such other information as may be required by the assistance awarding agency or State.
6. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
7. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
8. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards of merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
9. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
10. Will comply with all Federal statutes relating to non-discrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681 1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29) U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L . 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statue(s) under which application for Federal assistance is being made; and (j) the requirements of any other nondiscrimination statue(s) which may apply to the application.

11. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal and federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

12. Will comply with the provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

13. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333) regarding labor standards for federally-assisted construction subagreements.

14. Will comply with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

15. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

16. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

17. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq).

18. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit *Act Amendments of 1996 and OMB Circular No. A-133*, "Audits of States, Local Governments, and Non-Profit Organizations."

19. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

20. Will comply with the requirements of Section 106(g) of the Trafficking Victims Protection Act (TVPA) of 2000, as amended (22 U.S.C. 7104) which prohibits grant award recipients or a sub-recipient from (1) Engaging in severe forms of trafficking in persons during the period of time that the award is in effect (2) Procuring a commercial sex act during the period of time that the award is in effect or (3) Using forced labor in the performance of the award or subawards under the award.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
Jill No-Gale	Town Manager
APPLICANT ORGANIZATION	DATE SUBMITTED
Town of Chatham	April 3, 2019

DEPARTMENT OF HOMELAND SECURITY

Federal Emergency Management Agency

CERTIFICATIONS REGARDING LOBBYING; DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS; AND DRUG-FREE WORKPLACE REQUIREMENTS

O.M.B NO. 1660-0025
Expires September 30, 2017

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1.7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing, and submitting the form. This collection of information is required to obtain or retain benefits. You are not required to submit to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing the burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 500 C Street SW, Washington, DC 20472-3100, and Paperwork Reduction Project (1660-0025). **NOTE: Do not send your completed form to this address.**

Applicants should refer to the regulations cited below to determine the certification to which they are required to attest. Applicants should also review the instructions for certification included in the regulations before completing this form. Signature of this form provides for compliance with certification requirements under 44 CFR Part 18, "New Restrictions on Lobbying" and 28 CFR Part 17, "Government-wide Debarment and Suspension (Nonprocurement) and Government-wide Requirements for Drug-Free Workplace (Grants)." The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Federal Emergency Management Agency (FEMA) determines to award the transaction, grant, or cooperative agreement.

1. LOBBYING

As required by section 1352, Title 31 of the U.S. Code, and implemented at 44 CFR Part 18, for persons entering into a grant or cooperating agreement over $ 100,000, as defined at 44 CFR Part 18, the applicant certifies that:

(a) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the making of any Federal grant, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal grant or cooperative agreement.

(b) If any other funds than Federal appropriated funds have been paid or will be paid to any other person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or an employee of Congress, or employee of a member of Congress in connection with this Federal Grant or cooperative agreement, the undersigned shall complete and submit Stand Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

c) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subgrants, contracts under grants and cooperative agreements and subcontracts) and that all subrecipients shall certify and disclose accordingly.

☐ Standard Form-LLL "Disclosure of Lobbying Activities" attached
(This form must be attached to certification if non-appropriated funds are to be used to influence activities.)

2. DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS (DIRECT RECIPIENT)

As required by Executive Order 12549, Debarment and Suspension, and implemented at 44 CFR Part 67, for prospective participants in primary covered transactions, as defined at 44 CFR Part 17, Section 17.510-A.

A. The applicant certifies that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, sentenced to a denial of Federal benefits by a State or Federal court, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this application been convicted of a or had a civilian judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or perform a public a public (Federal ,State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1) (b) of this certification; and

(d) Have not within a three-year period preceding this application had one or more public transactions (Federal, State, or local) terminated for cause of default; and

B. Where the applicant is unable to certify to any of the statements in this certification, he or she shall attach an explanation to this application.

3. DRUG-FREE WORKPLACE (GRANTEE OTHER THAN INDIVIDUALS)

As required by the Drug-Free Workplace Act of 1988, and implemented at 44 CFR Part 17, Subpart F, for grantees, as defined at 44 CFR Part 17.615 and 17.620-

A. The applicant certifies that it will continue to provide a drug-free workplace by;

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an on-going drug free awareness program to inform employees about-

(1) The dangers of drug abuse in the workplace;

(2) The grantee's policy of maintaining a drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant to be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will-

(1) Abide by the term of the statement; and

(2) Notify the employee in writing of his or her conviction for a violation of a criminal drug statute occurring ion the workplace no later than five calendar days after such convictions;

(e) Notifying the agency, in writing, within 10 calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position, title, to the applicable FEMA awarding office, i.e., regional office or FEMA office.

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is convicted-

(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation act of 1973, as amended; or

(2) Requiring such an employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, City, County, State, Zip code)

☐ There are workplaces on file that are not identified

Sections 17.630 of the regulations provide that a grantee that is a State may elect to make one certification in each Federal fiscal year. A copy of which should be included with each application for FEMA funding. States and State agencies may elect to use a state wide certification.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
Jill R. Goldsmith	Town Manager
APPLICANT ORGANIZATION	DATE SUBMITTED
Town of Chatham	April 3, 2019

DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C.1352

Approved by OMB
0348-0046

1. * Type of Federal Action:
- [ ] a. contract
- [x] b. grant
- [ ] c. cooperative agreement
- [ ] d. loan
- [ ] e. loan guarantee
- [ ] f. loan insurance

2. * Status of Federal Action:
- [ ] a. bid/offer/application
- [x] b. initial award
- [ ] c. post-award

3. * Report Type:
- [x] a. initial filing
- [ ] b. material change

4. Name and Address of Reporting Entity:

[x] Prime [ ] SubAwardee

* Name	Town of Chatham
* Street 1	549 Main St.
Street 2	
* City	Chatham
State	MA
Zip	02633
Congressional District, if known:	9th

5. If Reporting Entity in No.4 is Subawardee, Enter Name and Address of Prime:

N/A

6. * Federal Department/Agency:

7. * Federal Program Name/Description:

CFDA Number, *if applicable:*

8. Federal Action Number, *if known:*

9. Award Amount, *if known:*

$

10. a. Name and Address of Lobbying Registrant:

Prefix		* First Name	Middle Name
* Last Name		Suffix	
* Street 1		Street 2	
* City		State	Zip

b. Individual Performing Services (including address if different from No. 10a)

Prefix		* First Name	Middle Name
* Last Name		Suffix	
* Street 1		Street 2	
* City		State	Zip

11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when the transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

* Signature:	Completed on submission to Grants.gov				
*Name:	Prefix	* First Name	Jill R-Glan	Middle Name	
		* Last Name	Goldsmith	Suffix	
Title:	Town Manager	Telephone No.:		Date:	Completed on submission to Grants.gov

Federal Use Only:

Authorized for Local Reproduction
Standard Form - LLL (Rev. 7-97)

MEMA Subrecipient Pre-Award Risk Assessment Questionnaire

Subrecipient (Applicant) Name: Town of Chatham
(Includes all departments, divisions, or units within the Municipality or Not-for-Profit receiving federal grant funds)

Per 2 CFR 200.331 section (b), MEMA is required to "evaluate each subrecipient's risk of non-compliance with Federal statutes, regulations, and the terms and conditions of the subaward for purposes of determining the appropriate subrecipient monitoring." Please provide the information requested below with your application.

MEMA grant program and fiscal staff will review past performance of subrecipient and information below to determine the extent to which, if any, monitoring or other measures may be taken to support subrecipient compliance.

(1): Has Subrecipient been the direct recipient or a subrecipient of MEMA-issued federal funds within the last two fiscal years:

Yes ☑ **No** ☐
(if no, please complete corresponding section on next page)

(2): Was Subrecipient required (OMB A-133 or 2 CFR 200 Subpart F) to have an audit of Federal Funds performed in the two most recently closed fiscal years?

Yes ☑ **No** ☐

Does Subrecipient have any findings or questioned costs related to MEMA federal grants administration in the last two most recently closed fiscal year Audits?

Yes ☐ **No** ☑
(if yes, please complete corresponding section on next page)

(3): Has Subrecipient employed new personnel or implemented new or substantially changed systems related to Federal Grant Management in the last calendar year?

Yes ☐ **No** ☑
(if yes, please complete corresponding section on next page)

(4): Has Subrecipient been monitored by any Federal Agency as a direct recipient of Federal Funding in the last two fiscal years.

Yes ☐ **No** ☐
(if yes, please complete corresponding section on next page)

(5): Does subrecipient conduct federally funded activities under an approved Internal Control Plan that meets federal guidelines and provides for sound financial management of grant activities, including:

- Detection and Prevention of Fraud, Waste, and Abuse;
- Accounting system identification of the receipt and expenditure of program funds separately for each grant/contract;
- Distribution records maintained for an employee when his/her effort are used as a direct cost or match;
- Procurements conducted in compliance with federal procurement requirements.

Yes ☑ **No** ☐
(if there are internal control plan concerns, please complete corresponding section on next page)

Continued on Back ➡

MEMA Sub-recipient Pre-Award Risk Assessment Questionnaire
Response Form

(1): If you have not received a grant from MEMA in the last two years, please indicate last grant received from MEMA:

Federal Award Name	Purpose	Amount	Start Date	End Date

(2): Please list below (or attach) the results of any A-133 or Subpart F audits for the last two fiscal years of subrecipient:

Grant Audited	Finding Date	Finding Description

MEMA will send a letter to subrecipient seeking additional details on the above finding(s), requesting subrecipient response and Corrective Action Plan, and setting a schedule for MEMA to issue a Management Decision.

(3): Please describe any new systems or staffing that may impact federal grant award administration:

(4): Please describe (or attach) the results of federal monitoring received within the last two fiscal years:

(5): Please describe any Internal Control-related concerns:

My signature below indicates that I have reviewed the relevant accounting, internal control, and program staffing and management systems of my organization, that the above information is complete and correct, and that all efforts to minimize the risk of noncompliance have and will be taken by my organization.

Signature Alexandra H Heilek **Date** 4/3/15

Printed Name Alexandra H. Heilek **Title** Finance Director

TOWN OF CHATHAM, MASSACHUSETTS

REPORTS REQUIRED BY GOVERNMENT AUDITING STANDARDS
AND THE UNIFORM GUIDANCE
FOR THE YEAR ENDED JUNE 30, 2018

TOWN OF CHATHAM, MASSACHUSETTS

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YEAR ENDED JUNE 30, 2018

SCAPPINI & PINA, P.C.

CERTIFIED PUBLIC ACCOUNTANTS

INDEPENDENT AUDITOR'S REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING AND ON COMPLIANCE AND OTHER MATTERS BASED ON AN AUDIT OF FINANCIAL STATEMENTS PERFORMED IN ACCORDANCE WITH *GOVERNMENT AUDITING STANDARDS*

To the Honorable Board of Selectmen
Town of Chatham, Massachusetts

We were engaged to audit, in accordance with the auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States, the financial statements of the governmental activities, business-type activities, the aggregate discretely presented component unit, each major fund, and the aggregate remaining fund information of the Town of Chatham, Massachusetts, as of and for the year ended June 30, 2018, and the related notes to the financial statements, which collectively comprise the Town of Chatham, Massachusetts' basic financial statements and have issued our report thereon dated March 1, 2019.

Internal Control over Financial Reporting

In planning and performing our audit of the financial statements, we considered the Town of Chatham, Massachusetts' internal control over financial reporting (internal control) to determine the audit procedures that are appropriate in the circumstances for the purpose of expressing our opinions on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of the Town of Chatham, Massachusetts' internal control. Accordingly, we do not express an opinion on the effectiveness of the Town of Chatham, Massachusetts' internal control.

A *deficiency in internal control* exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, misstatements on a timely basis. A *material weakness* is a deficiency, or a combination of deficiencies, in internal control such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected on a timely basis. A *significant deficiency* is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies and therefore, material weaknesses or significant deficiencies may exist that were not identified. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. We did identify certain deficiencies in internal control, described in the accompanying schedule of findings and questioned costs that we consider to be a significant deficiency. [2018-001].

Compliance and Other Matters

As part of obtaining reasonable assurance about whether the Town of Chatham, Massachusetts' financial statements are free from material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with those provisions was not an objective of our audit, and accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards*.

Town of Chatham, Massachusetts' Response to Findings

Town of Chatham, Massachusetts' response to the findings identified in our engagement is described in the accompanying schedule of findings and questioned costs. Town of Chatham, Massachusetts' response was not subjected to the auditing procedures applied in the engagement to audit the financial statements and, accordingly, we express no opinion on it.

Purpose of this Report

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the entity's internal control or on compliance. This report is an integral part of an engagement to perform an audit in accordance with *Government Auditing Standards* in considering the entity's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.

Scappini & Pina, P.C.
Norwell, Massachusetts
March 1, 2019

SCAPPINI & PINA, P.C.
CERTIFIED PUBLIC ACCOUNTANTS

INDEPENDENT AUDITOR'S REPORT ON COMPLIANCE FOR EACH MAJOR PROGRAM AND ON INTERNAL CONTROL OVER COMPLIANCE REQUIRED BY THE UNIFORM GUIDANCE

To the Honorable Board of Selectmen
Town of Chatham, Massachusetts

Report on Compliance for Each Major Federal Program

We have audited the Town of Chatham, Massachusetts' compliance with the types of compliance requirements described in the *OMB Compliance Supplement* that could have a direct and material effect on each of the Town of Chatham, Massachusetts' major federal programs for the year ended June 30, 2018. Town of Chatham, Massachusetts' major federal programs are identified in the summary of auditor's results section of the accompanying schedule of findings and questioned costs.

Management's Responsibility

Management is responsible for compliance with federal statutes, regulations, and the terms and conditions of its federal awards applicable to its federal programs.

Auditor's Responsibility

Our responsibility is to express an opinion on compliance for each of the Town of Chatham, Massachusetts' major federal programs based on our audit of the types of compliance requirements referred to above. We conducted our audit of compliance in accordance with auditing standards generally accepted in the United States of America; the standards applicable to financial audits contained in *Government Auditing Standards,* issued by the Comptroller General of the United States; and the audit requirements of Title 2 U.S. *Code of Federal Regulations* Part 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards* (Uniform Guidance). Those standards and the Uniform Guidance require that we plan and perform the audit to obtain reasonable assurance about whether noncompliance with the types of compliance requirements referred to above that could have a direct and material effect on a major federal program occurred. An audit includes examining, on a test basis, evidence about the Town of Chatham, Massachusetts' compliance with those requirements and performing such other procedures as we considered necessary in the circumstances.

We believe that our audit provides a reasonable basis for our opinion on compliance for each major federal program. However, our audit does not provide a legal determination of the Town of Chatham, Massachusetts' compliance.

Opinion on Each Major Federal Program

In our opinion, the Town of Chatham, Massachusetts, complied, in all material respects, with the types of compliance requirements referred to above that could have a direct and material effect on each of its major federal programs for the year ended June 30, 2018.

Report on Internal Control over Compliance

Management of the Town of Chatham, Massachusetts, is responsible for establishing and maintaining effective internal control over compliance with the types of compliance requirements referred to above. In planning and performing our audit of compliance, we considered the Town of Chatham, Massachusetts' internal control over compliance with the types of requirements that could have a direct and material effect on each major federal program to determine the auditing procedures that are appropriate in the circumstances for the purpose of expressing an opinion on compliance for each major federal program and to test and report on internal control over compliance in accordance with the Uniform Guidance, but not for the purpose of expressing an opinion on the effectiveness of internal control over compliance. Accordingly, we do not express an opinion on the effectiveness of the Town of Chatham, Massachusetts' internal control over compliance.

A *deficiency in internal control over compliance* exists when the design or operation of a control over compliance does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, noncompliance with a type of compliance requirement of a federal program on a timely basis. A *material weakness in internal control over compliance* is a deficiency, or combination of deficiencies, in internal control over compliance, such that there is a reasonable possibility that material noncompliance with a type of compliance requirement of a federal program will not be prevented, or detected and corrected, on a timely basis. A *significant deficiency in internal control over compliance* is a deficiency, or a combination of deficiencies, in internal control over compliance with a type of compliance requirement of a federal program that is less severe than a material weakness in internal control over compliance, yet important enough to merit attention by those charged with governance.

Our consideration of internal control over compliance was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control over compliance that might be material weaknesses or significant deficiencies. We did not identify any deficiencies in internal control over compliance that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

Report on Schedule of Expenditures of Federal Awards Required by the Uniform Guidance

We have audited the financial statements of the governmental activities, business-type activities, the aggregate discretely presented component unit, each major fund and the aggregate remaining fund information of the Town of Chatham, Massachusetts as of and for the year ended June 30, 2018, and have issued our report thereon dated March 1, 2019, which contained an unmodified opinion on those financial statements. Our audit was conducted for the purpose of forming opinions on the financial statements that collectively comprise the basic financial statements. The accompanying schedule of expenditures of federal awards is presented for purposes of additional analysis as required by the Uniform Guidance and is not a required part of the basic financial statements. Such information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the basic financial statements. The information has been subjected to the auditing procedures applied in the

audit of the financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the schedule of expenditures of federal awards is fairly stated in all material respects in relation to the basic financial statements as a whole.

The purpose of this report on internal control over compliance is solely to describe the scope of our testing of internal control over compliance and the results of that testing based on the requirements of the Uniform Guidance. Accordingly, this report is not suitable for any other purpose.

Scappini & Pina, P.C.
Norwell, Massachusetts
March 1, 2019

TOWN OF CHATHAM, MASSACHUSETTS
Schedule of Expenditures of Federal Awards
For the year ended June 30, 2018

Federal Grantor/Passthrough Grantor/Program Title	Federal CFDA Number	Agency or Passthrough Number	Federal Expenditures
U.S. Department of Homeland Security			
Direct - Firefighter Assistance Grant	97.044	N/A	$ 377,894
Passed through the Commonwealth of Massachusetts:			
Disaster Grants - Public Assistance	97.048	CTFEMA4097CHATH00139	63,036
Total U.S. Department of Homeland Security			440,930
U.S. Environmental Protection Agency			
Passed through the Commonwealth of Massachusetts:			
Capitalization Grants for Drinking Water State Revolving Funds	66.468	N/A	3,935,690
Total			$ 4,376,620

The accompanying notes to the Schedule of Expenditures of Federal Awards are an integral part of this schedule

TOWN OF CHATHAM, MASSACHUSETTS
NOTES TO SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS
YEAR ENDED JUNE 30, 2018

Note 1. Scope of Audit

The Town of Chatham, Massachusetts ("Town") is a governmental agency established by the laws of the Commonwealth of Massachusetts.

All operations related to the Town's Federal Grant Programs are included in the scope of the Title 2 U.S. Code of Federal Regulations Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance). The U.S. Department of Homeland Security has been designed as the Town's oversight agency for the audit.

Note 2. Period Audited

Single audit testing procedures were performed for the Town's federal grant transactions during the year ended June 30, 2018.

Note 3. Basis of Presentation

The accompanying schedule of expenditures of federal awards (the "Schedule") includes the federal award activity of the Town of Chatham under programs of the federal government for the year ended June 30, 2018. The information in this Schedule is presented in accordance with the requirements of Title 2 U.S. Code of Federal Regulations Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance). Because the Schedule presents only a selected portion of the operations of the Town, it is not intended to and does not present the financial position, changes in net assets, or cash flows of the Town.

Note 4. Summary of significant accounting policies

Expenditures reported on the Schedule are reported on the accrual basis of accounting. For new awards or modifications of existing awards after December 26, 2014, the expenditures reported in the Schedule follow the cost principles of the Uniform Guidance. For existing awards prior to December 26, 2014, the expenditures follow the cost principles contained in OMB Circular A-122, Cost Principles for Non-Profit Organizations. The cost principles indicate that certain types of expenditures are not allowable or are limited as to reimbursement.

TOWN OF CHATHAM, MASSACHUSETTS
SCHEDULE OF FINDINGS AND QUESTIONED COSTS
YEAR ENDED JUNE 30, 2018

A. Summary of Audit Results

Financial Statements

Type of auditors' report issued:	Unmodified	
Internal control over financial reporting:		
Material weakness(es) identified?	_____yes	__x__no
Significant deficiency(ies) identified?	__x__yes	____none reported
Noncompliance material to financial statements noted?	_____yes	__x__no

Federal Awards

Internal control over major programs:		
Material weakness(es) identifies?	_____yes	__x__no
Significant deficiency(ies) identified?	_____yes	__x__none reported
Type of auditors' report issued on compliance for major programs:	Unmodified	
Any audit findings disclosed that are required to be reported in accordance with 2 CFR 200.516?	_____yes	__x__no

Identification of major federal programs:

CFDA Number(s)	Name of Federal Program or Cluster
66.468	Capitalization Grants for Drinking Water State Revolving Funds

Dollar threshold used to distinguish between type A and type B programs:	$750,000	
The auditee qualified as a low-risk auditee?	_____yes	__x__no

B. Findings – Financial Statement Audit

Significant Deficiency
2018 – 001 Account Receivable Reconciliations

Condition: Many of the tax, user fee and other departmental receivable reconciliations between the Treasurer/Collector's and the Accountant's offices have unresolved variances.

Criteria: Internal controls should be in place to provide reasonable assurance that all accounts receivable are accurately recorded, activity tracked and reconciled in a timely manner.

Cause: Time restraints were experienced by the Treasurer/Collector's and the Accountant's offices that didn't allow for the variances to be fully investigated and corrected during the fiscal year.

Effect: Significant time is needed to complete the variance investigation process. When accounts receivable reconciliations are not completed timely and accurately, misstatements may exist and not be detected or corrected on a timely basis.

Recommendation: The Town should implement a process to regularly record, track and reconcile all accounts receivable balances and activity in the Town's ledger on a monthly basis, inclusive of identifying and correcting any variances.

View of responsible officials and planned corrective actions: The Town implemented procedures to reconcile balances and continues to make progress on the outstanding differences in receivables. A contract with an outside firm has been procured to assist in identifying the unresolved differences to ensure accurate reporting at the end of fiscal year 2019.

Prior Year Findings – Financial Statement Audit

Material Weakness
2017 – 001 Cash Reconciliations

Condition: Cash reconciliations were not completed timely and accurately throughout the year.

Recommendation: The Town should implement a process to reconcile the Treasurer's cash account balances both with the bank statements and the general ledger on a timely basis. The Town Accountant and Treasurer should complete monthly reconciliations and sign-off on their agreement of the reconciled balances.

Current Status: Throughout fiscal year 2018 the Treasurer and the Accounting office worked together to perform monthly cash reconciliations.

Material Weakness
2017 – 002 Accounts Receivable Reconciliations

Condition: Tax and user fee receivable reconciliations between the Treasurer/Collector's and the Accountant's offices were not completed during the year.

Recommendation: The Town should implement a process to regularly record, track and reconcile all accounts receivable balances and activity in the Town's general ledger on a monthly basis.

Current Status: This has been reported as a significant deficiency in 2018, please refer to finding 2018-001

Material Weakness
2017 – 003 Fixed Asset Infrastructure Inventory

Condition: The Town's fixed assets and infrastructure inventory must be reported in the Town's audited financial statements annually. The fixed assets and infrastructure inventory initially provided missed approximately $2.7 million of additions last year.

Recommendation: The Town should implement a process to regularly record and track a fixed asset and infrastructure inventory, inclusive of current and accumulated depreciation for inclusion in the Town's financial statements.

Current Status: The Town has implemented procedures to improve the process to capture and record fixed asset additions and disposals in the fixed asset and infrastructure inventory.

C. Findings – Major Federal Award Programs - None

D. Prior Year Findings – Major Federal Award Programs - None