Route 6 (Marion & Wareham Roads) over Weweantic River
(M-05-001=W-06-013 & W-06-016) Bridge Replacement Project
Marion and Wareham, Massachusetts
Section 401 / Section 404 Clean Water Act Authorizations
Wetland Replication / Mitigation Plan and Schedule Narrative

1.0 Introduction

BSC Group, Inc. (BSC) on behalf of the Massachusetts Department of Transportation (MassDOT) is submitting this Wetland Replication/Mitigation Plan and Schedule ("Mitigation Plan") for the above referenced project. This Mitigation Plan has been prepared in accordance with the Federal Clean Water Act (Sections 401 and 404). The proposed project is not subject to the Massachusetts Wetland Protection Act (WPA) (Chapter 131 s. 40) and its implementing regulations (310 CMR 10.00) as it is considered bridge exempt under the Massachusetts Bond Bill. Additionally, this project is considered coastal, not inland, proposing mitigation as salt marsh, for which there are not formalized replication guidelines. Therefore, this project has been prepared in general accordance with the Massachusetts Inland Wetland Replication Guidelines for unavoidable project impacts under the WPA implementing regulations. For the purpose of this Mitigation Plan, the "Project" or "Project Area" will be used synonymously to describe the specific areas of wetland impact and the areas of proposed replication. The following Attachments have been provided with this Wetland Mitigation Narrative:

- Mitigation Site Plan with Planting Details and Erosion and Sedimentation Control
- Wetland Mitigation Specification

2.0 Wetland Mitigation Goals and Objectives

Wetland mitigation goals have been identified to mitigate for the wetland impacts associated with the Project. Given the overall project site constraints, impacts to salt marsh and vegetated wetlands will be mitigated jointly into a single salt marsh site by grading the area up to the delineated salt marsh edge and planting appropriate salt marsh vegetation within the site. Mitigating a larger salt marsh in lieu of a vegetated wetland site will better ensure site success and inhibit the otherwise likely extension of brackish invasives such as *Phragmites australis* which already occur within the project area. Additionally, since the proposed plan is to build landward, and there is established salt marsh grass along the Weweantic River, the site is stable-enough to tolerate slow transition into a mitigation parcel. As sea levels rise, salt marsh naturally expands landward. This proposed design provides for a "natural" landward expansion, as the proposed site will lower the land elevation, and therefore will promote landward migration of the existing marsh system. A total of 2,677 sf of permanent impacts to vegetated wetlands and salt marsh are proposed; however, an area of approximately 5,930 sf has been selected and included in the project as an identified salt marsh mitigation area including replication at current and projected elevations. While MassDOT's compliance success requires the mitigation to a 1:1 replacement, the proposed 2.22:1 size of the

mitigation site is intended to both enable the site's success and provide a buffer to assure compliance now and in the future.

Again, while not subject to the inland replication guidance of the WPA as a coastal, bridge exempt, salt marsh mitigation project, mitigation is designed within the loosely applied accordance of 314 CMR 9.00 310 CMR 10.55(4)(b). The following conditions have been considered in the proposed mitigation design:

Surface area must be equal to the lost area: There are 2,677 sf of permanent impacts proposed to vegetated wetlands and salt marsh associated with the bridge replacements across the project site. An area of approximately 5,930 sf (~2.22:1 replacement) has been selected for salt marsh mitigation to replace the habitat lost during construction. Of this, 4,090 square feet equate to qualified replication below High tide Line (HTL) (~1.53:1 replacement) and an additional 1,840 sf of high marsh (~0.69:1 additional replacement) is proposed to extend from the tide line to transitional upland planting. Additionally, while MassDOT is only responsible to mitigate for in a 1:1 replacement, this represents a ~2.22:1 mitigation ratio which exceeds MassDEP requirement. It is recommended that the ratio be doubled for salt marsh mitigation in order to ensure better establishment in the mitigation area and meet at least the 1:1 ratio required.

The replication area must have similar ground water and surface elevation as the lost area: The proposed mitigation area will be graded to tie-into the existing landward salt marsh boundary elevations within the project area by lowering the surface elevation to allow for effective tidal water movement into the area. While replanting mostly higher salt marsh species *(S. patens)*, due to the site grading restraints (not wanting to affect the existing marsh) only limited areas will be planted with low salt marsh grass *(S. alterniflora)*. The interplanting is done so in case one species finds more success than the other as the area becomes inundated with water and sediments move around. As the mitigation site will be graded into upland at the backend, a small berm is also proposed in order to prevent excessive freshwater from the existing drainage system from affecting the salt content of the site. This is to reduce the risk of invasive *Phragmites australis,* which is already present within the proposed mitigation parcel. The proposed mitigation area is located adjacent to the impact areas, and therefore it has been assumed that ground and surface elevations are similar. The design also continues the gradual slope into the upland area allowing planned salt marsh migration landward to keep pace with sea level rise.

The replication area must have a similar location relative to the bank as the lost area: The identified replacement area shall be in-compliance. All impacted vegetated wetland and salt marsh areas occurs adjacent to the existing crossings, and the mitigation area will also be both hydrologically and physically connected to the project area.

The replication area must have an unrestricted hydraulic connection to the same water body or waterway as the lost area: The identified replacement area shall be in-compliance. All impacted vegetated wetland and salt marsh occurs adjacent to the existing crossings. The proposed mitigation area will be situated adjacent to the areas of impact, and therefore have a direct and unrestricted hydraulic connection to the Weweantic River.

The location of the replication must be in the same general areas as the lost wetland: The identified replacement area shall be in-compliance. All impacted vegetated wetland and salt marsh occurs adjacent to the existing crossing, and the mitigation area will also be both hydrologically and physically connected to the project area.

The replication must have at least 75% cover of native wetland plants within two growing seasons, and there must be temporary stabilization of exposed soil to avoid erosion: On-site topsoil will be replaced by clean, coarse sand and topsoil to provide growing medium necessary for native salt marsh plugs and native shrubs to reestablish at least 75% of the surface of the replacement area to a 1:1 ratio within 2,677 sf of the site within two growing seasons.

3.0 Construction Scheduling and Sequencing

It is anticipated that construction associated with the proposed mitigation area will occur as early as practicable during the proposed bridge construction. It is recommended that planting should occur between May to June.

1. A construction start notification will be made to the U.S. Army Corps of Engineers (USACE) and MA Department of Environmental Protection (MassDEP) prior to the start of work.

2. Prior to construction activities, a meeting of construction personnel, site inspectors, and a Wetland Specialist familiar with the project will occur to discuss expectations and environmental permit requirements. Additionally, construction activities associated with wetland mitigation design elements (e.g. planting, excavation depth) will occur under the direction of the Wetland Specialist.

3. A turtle sweep will be required by a qualified turtle monitor, to be approved by MassDOT Wildlife Unit, before construction may occur further.

4. Erosion and sedimentation controls will be installed according to Wetland Specialist / Resident Engineer prior to the start of construction activities according to plans. After installation of the Combination Protection Fence (see plans and Spec, Item 754.3), the turtle monitor will sweep the enclosed site.

5. As directed by the Wetland Specialist, remove soil affected by invasive weed seed and replace with clean, coarse sand or topsoil as necessary for work. Wetland Specialist will remain on-site to determine final excavation depth versus ability to maintain existing cedars on-site.

6. Install plants per details and under the direction of the Wetland Specialist, the upland mitigation areas will be stabilized with straw mulch. The contractor must ensure the mulches are free of invasive weed seeds.

7. Following planting and mulching, of surrounding upland slopes over 3:1 jute matting will be placed over the mulched areas to ensure that newly placed soils and plants are not washed away/damaged prior to site stabilization. Jute matting should be stabilized with biodegradable wooden stakes. Do not use netting in intertidal areas. Goose fence will be applied as a temporary measure around the planted marsh during establishment to allow new plants to establish fully, it shall be removed upon approval of established saltmarsh vegetation.

8. Upon completion of planting activities, inspect all installed erosion and sedimentation control measures, repair as necessary, and install additional barriers as necessary to prevent erosion and sedimentation from upland areas into the mitigation areas. Adequate erosion control measures should include, but not be limited to, the use of 100% biodegradable compost filter tubes. Set stakes and thin ropes with flags per details for plant protection.

9. Vegetation will be weeded and replanted as directed by the Wetland Specialist and inspected for approval, after 60 days of growing season from written approval of completed installation, (minimum 75% native cover) and Establishment period 1 year (still 75% native cover with clear establishment). MassDOT is only responsible for reestablishing at least 75% of the surface of the replacement area to a 1:1 ratio within 2,677 sf of the site within two growing seasons.

4.0 Mitigation Area Erosion Control and Site Stabilization Measures

An important component of successfully achieving the goals and objectives of the Mitigation Plan is the long-term stability of the proposed mitigation areas. Long term stability involves the survival of vegetation and soil conditions that remain stable under post construction conditions. Additionally, invasive species control is an important component of the goals of the Mitigation Plan and should be facilitated by stable soil conditions and a diverse and healthy plant community characterized by herbaceous vegetation species. The following erosion control measures will be implemented during and immediately following the construction of the mitigation areas.

Combination Protection Fence Compost Filter Tubes/Straw Wattle or similar: Combination protection fence (filter tubes or similar and turtle fencing) will be used as an alternative to strawbales and silt fence erosion control at the boundary between existing wetland areas and the proposed areas of disturbance during mitigation area construction. Compost filter tubes alone will be used as an additional berm diversion. Following the completion of project activities compost filter tubes will be cut and all synthetic materials removed from the site. In areas highly subject to erosion, strawbale and silt fence may be utilized as an alternative erosion control measure to compost filter tubes. It will be determined in the field by site personnel whether strawbale and erosion control measures should be utilized and when they will be removed.

Soils: As recommended by the *USACE Wetland Compensatory Mitigation Guidance Manual*, manmade topsoil shall consist of equal volumes of organic and mineral materials. Well-decomposed, clean leaf litter compost is the preferred soil amendment to achieve these standards. Efforts should be made by the contractor to avoid over-compaction of applied topsoil by heavy

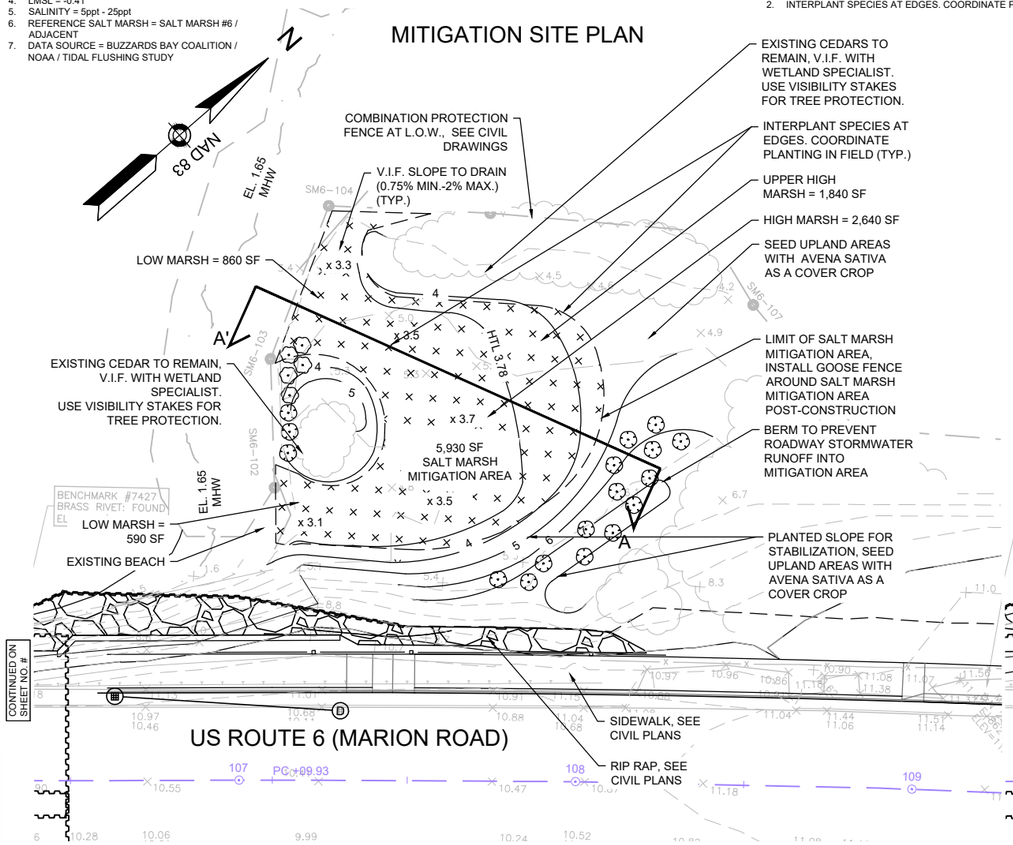
machinery during grading of the mitigation site. Hand spreading of topsoil is recommended, however where the use of machinery is unavoidable, disking or hand scarifying of the soils must occur by hand prior to planting.

Vegetation: Plugs, seed, and containerized shrubs shall be planted according to the plan specification and under the direction of the Wetland Specialist.

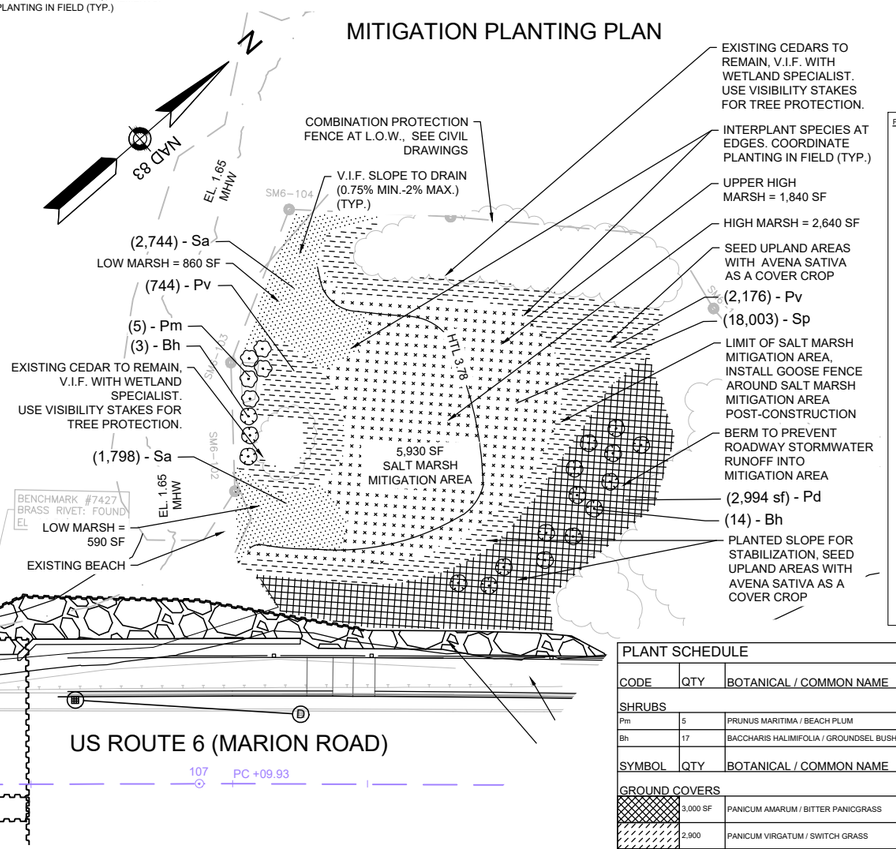
EXISTING SITE NOTES:
1. HTL = 3.78'
2. MHHW = 2.09'
3. MHW = 1.65'
4. LMSL = -0.41'
5. SALINITY = 5ppt - 25ppt
6. REFERENCE SALT MARSH = SALT MARSH #6 / ADJACENT
7. DATA SOURCE = BUZZARDS BAY COALITION / NOAA / TIDAL FLUSHING STUDY

GENERAL NOTE:
1. MITIGATION AND PLANTING AREA SHOWN ON PLAN IS CONSIDERED SCHEMATIC IN NATURE, AND SHALL BE COORDINATED AND VERIFIED IN THE FIELD BY THE WETLAND SPECIALIST. AREAS AND NUMBERS OF PLANTS MAY CHANGE PER THE PERMIT REQUIREMENTS.
2. INTERPLANT SPECIES AT EDGES. COORDINATE PLANTING IN FIELD (TYP.)

MITIGATION SITE PLAN



MITIGATION PLANTING PLAN



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MARION-WAREHAM
WAREHAM RD/MARION RD (US 6)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-		
PROJECT FILE NO.	605311		

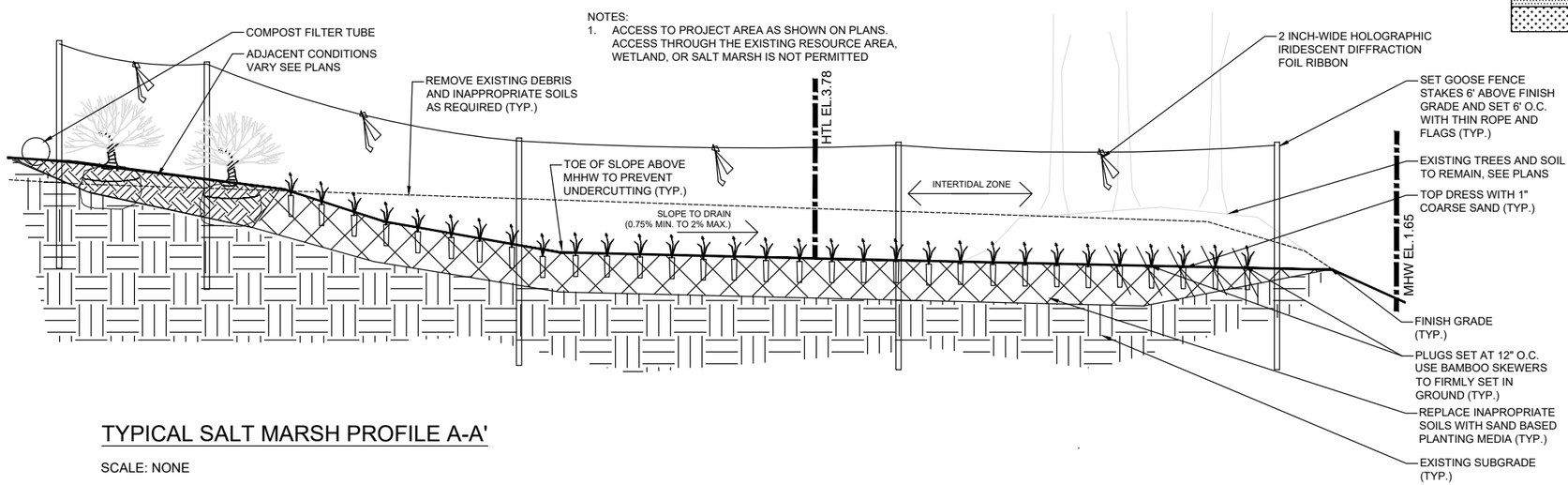
MITIGATION PLAN
SHEET 1 OF 1

PLANTING NOTES:
1. VERIFY EXISTING UTILITY LINES PRIOR TO PLANTING AND REPORT CONFLICTS TO THE RESIDENT ENGINEER.
2. CONTRACTOR SHALL COORDINATE PLANTING INSTALLATION WITH WORK BEING DONE BY OTHERS.
3. TREES TO BE SAVED SHALL BE PROTECTED. USE TREE AND PLANT PROTECTION - VISIBILITY STAKES. WORK SHALL NOT OCCUR BEYOND AREA DELINEATED BY STAKES.
4. NO PLANTING SHALL OCCUR PRIOR TO ACCEPTANCE OF FINAL GRADING.
5. PLANT MATERIAL SHALL CONFORM TO THE MINIMUM GUIDELINES ESTABLISHED BY THE AMERICAN STANDARD FOR NURSERY STOCK PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN, INC SEE SPECIFICATION FOR DETAILED REQUIREMENTS. PROPOSED SUBSTITUTIONS OF PLANT MATERIAL SHALL BE MADE WITH MATERIAL EQUIVALENT TO THE DESIRED MATERIAL IN OVERALL FORM, HEIGHT, BRANCHING HABIT, FLOWER, LEAF, COLOR, FRUIT AND CULTURE.
6. PLANT QUANTITIES NOTED IN THE PLANT SCHEDULE ARE APPROXIMATE AND ARE PROVIDED FOR THE CONVENIENCE OF THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FURNISHING AND INSTALLATION OF PLANT MATERIALS NOTED ON THE PLANTING PLAN.
7. PLANTED AREAS SHALL BE PITCHED A MINIMUM OF 0.75% TO 2% MAXIMUM FOR SALT MARSH AREA, AND 3:1 MAX OUTSIDE THE MITIGATION AREA.
8. INSTALL PLANTS WITH ROOT FLARES FLUSH WITH GRADE. IMMEDIATELY REPLANT PLANTS WHICH SETTLE OUT OF PLUMB OR BELOW FINISH GRADE. CAUTION SHALL BE USED NOT TO EXTEND MULCH LAYER ABOVE SOIL LEVEL AT TRUNKS/STEMS OF INSTALLED PLANT MATERIAL.
9. THE CONTRACTOR IS RESPONSIBLE FOR FULLY MAINTAINING PLANTING (INCLUDING BUT NOT LIMITED TO: WATERING, SPRAYING, MULCHING, FERTILIZING, ETC.) OF THE PLANTING AREAS UNTIL THE WORK IS ACCEPTED IN TOTAL BY THE RESIDENT ENGINEER. PROVIDE A MINIMUM EQUIVALENT OF 1" OF RAIN PER WEEK DURING THE ESTABLISHMENT PERIOD. WATERING SHALL ONLY OCCUR UPLAND, MARSH WATERING IS NOT REQUIRED.
10. PLANT MATERIAL WHICH DIES, TURNS BROWN, OR DEFOLIATES (PRIOR TO FINAL ACCEPTANCE OF THE WORK) SHALL BE PROMPTLY REMOVED FROM THE SITE AND REPLACED WITH MATERIAL OF THE SAME SPECIES, QUANTITY, AND SIZE AND MEET PLANT LIST SPECIFICATIONS.
11. THE CONTRACTOR SHALL COMPLETELY GUARANTEE PLANT MATERIAL FOR A PERIOD OF ONE (1) YEAR BEGINNING ON THE DATE OF FINAL ACCEPTANCE. THE CONTRACTOR SHALL PROMPTLY MAKE REPLACEMENTS BEFORE OR AT THE END OF THE GUARANTEE PERIOD, AS DIRECTED BY THE RESIDENT ENGINEER WITHIN THE SPECIFIED PLANTING WINDOW.

PLANT SCHEDULE

CODE	QTY	BOTANICAL / COMMON NAME	CONT	HT.		REMARKS
SHRUBS						
Pm	5	PRUNUS MARITIMA / BEACH PLUM	3 GAL	18"-24"		
Bh	17	BACCHARIS HALIMIFOLIA / GROUNDSEL BUSH	3 GAL	18"-24"		
SYMBOL	QTY	BOTANICAL / COMMON NAME	CONT		SPACING	REMARKS
GROUND COVERS						
	3,000 SF	PANICUM AMARUM / BITTER PANICGRASS	SEED			
	2,900	PANICUM VIRGATUM / SWITCH GRASS	PLUG		12" o.c.	
	4,550	SPARTINA ALTERNIFLORA / SALT MARSH GRASS	PLUG		6" o.c.	
	18,000	SPARTINA PATENS / SALTMEADOW CORDGRASS	PLUG		8" o.c.	

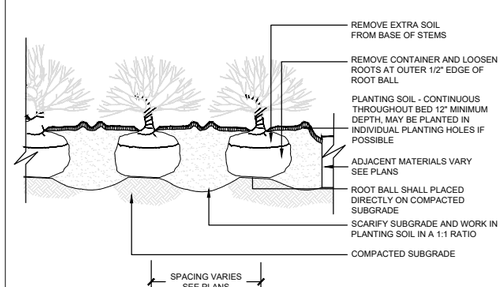
NOTES:
1. ACCESS TO PROJECT AREA AS SHOWN ON PLANS. ACCESS THROUGH THE EXISTING RESOURCE AREA, WETLAND, OR SALT MARSH IS NOT PERMITTED



TYPICAL SALT MARSH PROFILE A-A'

SCALE: NONE

NOTES:
1. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. NO PRUNING OR CUTTING UNLESS DIRECTED BY THE WETLAND SPECIALIST.
3. SAUCER SHALL BE FLOODED TWICE DURING THE FIRST 24 HOURS AFTER PLANTING.
4. SHRUBS SHALL BE SET PLUMB AND PLANTED SO THAT THE TOP OF THE TOP OF THE ROOTS IS 1"-2" ABOVE FINISHED GRADE OR CONTAINER SURFACE IS AT GRADE.



SHRUB PLANTING BED

SCALE: NONE

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ITEM 755.2 TIDAL WETLAND MITIGATION AREAS – TIDAL LS

Work under these items shall conform to the relevant provisions of Sections 120, 770, 771 and the following:

The work under this Item includes the furnishing of all labor, transportation, equipment, materials and plants required for construction, protection, and maintenance of Tidal Wetland Mitigation Areas as compensation for proposed impacts to existing tidal wetlands. Tasks include erosion controls, excavation, fine grading, goose fence installation, planting, maintenance, and removals as shown on the Plans and as required by the Engineer.

DESCRIPTION OF WORK
To ensure that no loss of wetland function results from the proposed project, Tidal Wetland Mitigation Areas characterized by Salt Marsh shall be replicated through constructed wetlands and/or restored by planting in existing substrates in areas shown on the Plans. Tidal Wetland Mitigation Areas shall hereafter be referred to as Mitigation Areas. The following minimum area requirements shall be met for the Wetland Mitigation Area location shown on the Plans.

Salt Marsh Mitigation Area
Project Area = ***5,930*** sf.

Upland buffer restoration Area
Project Area = ***6045*** sf.

Mitigation Areas shall be constructed to meet the requirements of the permits and consistent with the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 of the Clean Water Act pertaining to Water Quality Certification (314 CMR 9.06(2)), and the U.S. Army Corps of Engineers - New England District Compensatory Mitigation Guidance.

The Contractor shall be responsible for protection and preservation of natural areas adjacent to the wetland mitigation area both within and outside of the project limits for the duration of the contract period. Access to Mitigation Areas shall be clearly defined in order to minimize damage to existing vegetation and soils. The Contractor shall use duck boards or mats, as necessary, to minimize impacts from foot paths or construction equipment. All labor and materials required for protection and preservation site shall be incidental to this item. Damage to soils or vegetation due to trampling, vehicles, storing of materials, debris, or negligence shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

To protect new herbaceous plantings from grazing by geese, Goose Fence shall be installed according to Wetland Specialist in order to enclose tidal wetland planting areas and prevent geese from flying, swimming or walking into the area. All costs associated with installation, maintenance and removal of Goose Fence are incidental to this item.

SUBMITTALS
Contractor shall submit the following for approval by the Engineer in consult with the MassDOT Landscape Architect at least sixty (60) days prior to installation. The Contractor shall make all submittals to the Engineer in a timely and complete manner.

Sand: Contractor shall submit for approval all sources of clean sand prior to ordering. Soil tests shall be provided to the Engineer for approval at least thirty (30) days prior to delivery. Off-site sources shall be identified and available for inspection by the Wetland Specialist prior to transport of sand to the site to verify that sand brought in from off-site is free of invasive plant species including all viable plant parts.

Plants: Source of purchased plant material, confirmation of availability, and certification of provenance from the nursery supplier must be approved / confirmed in advance of project construction start, as applicable. Species substitutions must be approved in writing by the MassDOT Landscape Design Section prior to ordering and at least sixty (60) days prior to installation.

Photographic Documentation: Prior to any disturbance, clear and legible digital photographs with date and time stamps shall be taken of the existing site conditions including existing wetlands to be impacted, all proposed wetland mitigation sites and reference/model wetland areas, typically an adjacent undisturbed wetland. These shall be submitted to the Engineer on CD / DVD / USB format.

MATERIALS
All materials are incidental to this item unless specified otherwise.

Plants: Ideally, a significant number of the sourced plants should come from adjacent impacted salt marsh to extent practicable.

Subsoil: Organically amended subsoil should be purchased from an approved vendor. It will pre-mixed and applied prior to placement of course sand surface cover materials M104.1.

Erosion Controls:
Combination Protection Fence (CPF):
See Construction Plans / Specs for Combination Protection Fence (CPF) Details. Combination Protection Fence shall conform to all requirements thereof. Dimensions of fencing / materials provided shall be sufficient to meet the installation requirements within entire project and within the intertidal zone.

Soils:
Imported soils for planting shall be coarse sand conforming to the requirements of M1.04.0 Type 'a' Sand Borrow per Division III of the Standard Specifications. Compost or organic soil amendments shall not be used in tidal wetland areas. No soil or soil amendment shall be brought on site without prior approval of the material source and test results approved by the Engineer.

Existing clean sandy soil or existing peat mat in situ that is free of unacceptable materials and meets the target elevations shall be considered suitable for planting in salt marsh areas.

Soil within the top 1-foot depth of the proposed Mitigation Area surfaces shall be spot checked for unacceptable material. Unacceptable materials include rubble, debris, large rocks, invasive plant material or other foreign matter. Unacceptable materials shall be removed from the site prior to final grading and/or planting.

Usable sand without organic matter may be stripped and stockpiled for re-used in salt marsh replication areas. Sand excavated from the intertidal zone may be saline. Saline soils shall not be used in landscape areas outside tidal wetlands of similar salinity. Excavated soils shall be stockpiled outside resource areas and stored at least 100-feet from the edge of the wetland. Precautions shall be taken as necessary to prevent erosion of the stockpiled material. In the event there is excess borrow, it shall be disposed of without additional compensation.

Existing hydric soils that have been excavated and stockpiled may be chemically altered after drying and are not an acceptable planting substrate in salt marsh areas. Existing soils containing or potentially containing viable parts of invasive plant material shall not be relocated on-site and must be disposed of off-site at an approved disposal facility.

Plant Material:
The Contractor shall source plants to the species and sizes shown on the Mitigation Plans. Contractor to order plants several months in advance to ensure that roots are fully developed, as required. Coordination with MassDOT and supplier to confirm that the species and sizes shown on the Plans are available will be of paramount importance to the success of the site.

All plant material shall conform to the current issue of American Standard for Nursery Stock (ASNS), ANSI Z-60.1, latest edition published by American Association of Nurserymen (AAN), with: American Standard for Nursery Stock (ASNS), ANSI Z60.1-2004, or latest edition, published by American Nursery and Landscape Association (ANLA), (formerly American Association of Nurserymen). Other subsequent references to AAN should likewise be revised to ANLA.

All plant material shall be species native to the region. As per current recommendations by the NOAA Restoration Center and the EPA Ecoregion Assessment, in order to maintain genetic diversity, only native species of seed and plants collected from the EPA Level III Ecoregion of the project area shall be used for ecosystem restoration. The EPA Level III Ecoregions of Massachusetts are Ecoregion 84 Atlantic Coastal Pine Barrens which encompasses Barnstable, Dukes, Nantucket and Plymouth Counties. Ecoregion 59 Northeastern Coastal Zone encompasses the remainder of Massachusetts. The current EPA map, Ecoregions of the Continental United States, is available through the following link: ftp://ftp.epa.gov/wed/ecoregions/us/Eco_Level_III_US.pdf
The nursery source shall certify that the provenance, or origin, of the seed from which the plants were produced is from the applicable EPA Level III Ecoregion.

Transplants and plant material collected from the wild outside of the construction impact area is prohibited. Collection within the construction impact area should be performed as approved in writing by the Wetland Specialist. All other Plant materials shall be selected from certified nurseries that have been inspected by state and/or federal agencies. Nursery inspection certificates shall be furnished to the Engineer upon request.

All plant material used shall be nursery grown and healthy, sound and free of disease, insect pests, eggs or larvae, discolorations, leaf wilting or curling and weeds. Container grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil after removal from the container. Roots shall visibly extend to the inside face of the growing container but shall not be root-bound or girdling. Plants grown in peat

pots shall be well-rooted through the pot with 4-6 stems per pot and stems at least 6-inches in height.

Plant material intended for tidal wetlands shall be acclimated to the salinity of the adjacent water body. Salinity acclimation shall be done incrementally at the nursery to bring the plants up to a tolerance of the site salinity. Plants shall be thriving in the nursery at the target salinity level for a minimum of two weeks prior to delivery.

All plants shall be delivered to the site as live, actively growing or just breaking dormancy, and arrive to the project site ready for planting. The Resident Engineer and/or Wetland Specialist may reject plants damaged in handling or transport. Plant material shall be installed as soon as possible after it has been delivered to the site.

Soil and root mass shall be watered and moist upon delivery to the job site. Plants with dry soil and roots shall not be acceptable. All plant materials temporarily stored at the site prior to planting shall be stored out of direct exposure to sun and wind, shall be maintained by careful watering and shall be protected from damage due to construction activities and adverse weather. Plants stored improperly may be rejected and shall be replaced by the Contractor at no additional cost to MassDOT.

No plants shall be installed until the Wetland Specialist approves the condition of the plant material and the process of installation.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT Landscape Architect at least ninety (90) days prior to planting. The Contractor shall submit a list of nurseries that were contacted and unable to supply the species as shown on the Plans. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Goose Fence:

Netting:	UV-stabilized polypropylene netting, such as typical of deer netting, to be approved by MassDOT Landscape Architect
Structure:	square or quadrangular
Mesh size:	1-inch (max.) in either longitudinal or transversal direction
Color:	black
Tensile strength:	308 lbs. (min.)
Elongation:	20 % (max.)
Fasteners:	minimum 10-inch long UV-stabilized nylon cable ties
Posts:	2-inch x 2-inch untreated hardwood stakes. Metal stakes are not an acceptable substitute.
Overhead lines:	#18 white, braided nylon twine; 20# white polished hemp twine; or approved equal.
Bird repellent ribbon:	2 inch-wide holographic iridescent diffraction foil ribbon. Available from the following manufacturers or approved equal. ¾ inch wide: Holographic Bird Scare Tape from Dalen 2 inch wide: Tanglefoot Repeller Ribbon from Contech 2 inch wide: Irri-tape from Bird-X

Water:
Plant material shall be saturated with fresh water before delivery, upon delivery to the site and twice daily up to time of installation. The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. According to DEP requirements, water from the river shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water or use of contaminated water.

METHODS
Site Preparation:
Prior to an initial site meeting, the Contractor shall stake out Mitigation Area boundaries and set grade stakes in the field. Prior to the start of work, the Contractor shall walk the site with the Engineer, Wetland Specialist, and MassDOT Landscape Architect for an initial site meeting. The purpose of the meeting is to verify limits of work, locations and installation of Phase 1 erosion controls, proposed construction methods, and grade stake elevations.

Erosion and Sediment Control:
The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill or other foreign materials that could be washed or otherwise carried into Mitigation Areas and nearby wetland resource areas. Erosion controls shall be in place prior to any construction activities.

The Engineer and Wetland Specialist shall inspect and approve erosion and sediment control measures prior to excavation work. The Contractor shall remove sediment deposits as necessary to maintain the filters in working condition. The Contractor shall maintain erosion controls in a functional condition at all times, including inspections after each rainfall and at least daily during prolonged rainfall and shall immediately correct all deficiencies.

Phase 1 Erosion Controls for Tidal Wetlands:
CPF shall serve as temporary erosion control during site preparation, excavation, grading and planting operations. Floating turbidity curtains shall not be acceptable for use above the mean low water line. CPF shall also act as a limit of work barrier for all heavy equipment. It is the Contractor’s responsibility to ensure that adequate erosion control measures are in place and maintained to prevent suspended sediment and siltation from entering adjacent waters and wetlands.

CPF shall be installed along the border between existing salt marsh and the channelward limit of salt marsh replication areas. The CPF shall begin and end in the surrounding upland and shall be placed so that no excavated material or disturbed soil can enter adjacent wetlands or waters. Silt fencing shall be trenched into soil and secured to prevent sediment transport out of the work area. The top of siltation barrier shall extend above the highest tide elevations predicted for the period of work in order to contain suspended sediment within the work area during high tides and storm events. If necessary, CPF shall be reinforced with wire or plastic mesh to withstand the forces of flooding and ebbing tides.

Immediately following acceptance of wetland planting, the channelward CPF shall be removed to allow unimpeded tidal flow across the site. Trenches and disturbed soil shall be restored to a smooth and level surface relative to surrounding areas. Exiting vegetation disturbed by erosion

control installation and removals shall be replanted as directed by the Engineer and Wetland Specialist.

Phase 2 Erosion Controls for Tidal Wetlands:
Following acceptance of final grades and prior to planting in salt marsh replication areas, compost filter tubes shall be installed as a second line of erosion control above the Mean High High Water (spring high tide) line along upper limits of the Mitigation Areas.

Upon final acceptance of adjacent seeding, the compost filter tubes shall be cut open, compost spread evenly over the soil surface a maximum depth of 2-inches and the composted area shall be seeded with same seed mix used for upland stabilization. Stakes, ropes and other non-biodegradable materials shall be removed and disposed of offsite by the Contractor.

Excavation and Grading:
Final grades in the salt marsh replication areas shall conform to target elevations as shown on the Plans and as approved by the Wetland Specialist. These areas shall be staked and grades set for approval prior to clearing and excavation. To the extent possible, limits shall be a minimum of 6 feet from trunk of trees that are to remain. Actual limits of mitigation areas may be adjusted in the field to protect root systems of existing trees. However, the total area of Wetland Mitigation required by all permits shall not be reduced. Wetland Specialist will remain on-site to determine final excavation depth versus ability to maintain existing cedars on-site.

Sequence and execution of work shall ensure minimal compaction and no heavy equipment moving over replacement soils. If heavy equipment is required to travel over existing wetland soils, wood mats shall be placed to minimize impacts. Upon acceptance of final grades, no heavy equipment or equipment shall travel across mitigation areas or adjacent wetland resource areas.

Salt marsh restoration areas shall conform to existing and/or adjacent grades.

The Contractor shall provide a minimum depth of one (1) foot of suitable planting substrate for salt marsh replication areas as defined in the materials section. If unacceptable material is found, it shall be removed from the soil. Soil that is beyond usable quality as determined by the Engineer and Wetland Specialist shall be disposed of off-site.

If suitable soils are not present at the required depth within the target elevations, the mitigation area shall be excavated to a depth of one (1) foot below proposed target elevations and backfilled with clean, coarse sand. Special hydric soils or organic amendments are not required for tidal wetland areas.

The Contractor shall identify existing areas of established invasive plants within the Mitigation Area and notify the Engineer and MassDOT Landscape Architect of the condition. Soil containing invasive plant material shall be excavated and disposed of off-site at an approved facility.

All cut trees, stumps, brush, wrack or vegetation not specified to remain shall be removed from Mitigation Areas unless directed otherwise by the Engineer and Wetland Specialist. Materials shall not to be stockpiled in the resource areas or buffer zone while awaiting disposal.

The finished grade shall be at an elevation that will provide a hydrologic connection between the replacement area and adjacent wetlands or water source. The Contractor shall verify that this elevation is not at a level that could dewater or flood an adjacent non-tidal wetland. The hydrologic connection should be in keeping with restoring the intended function of the replacement wetland.

After grading, Contractor shall allow a Settling Period of one full tide cycle, approximately two weeks, for substrates to settle before acceptance of final grades. Prior to planting, the Engineer and Wetland Specialist shall confirm that the target elevations have been achieved and provide approval of final grades to the Contractor. If settling or shifting occurs during the settling period, correct final grades before planting and removal of CPF from salt marsh replication areas.

Mitigation Area Planting:
Planting shall be overseen by the Wetland Specialist. Plants shall be installed while planting surface is in the dry and according to the Plans. If planting includes more than one intertidal zone planting area, the Wetland Specialist shall flag out limits of intertidal zones prior to planting.

Plants shall be installed within the range of target elevations within the intertidal zone and at the spacing shown on the Plans. In salt marsh restoration areas, plugs shall be installed to fill in gaps among existing vegetation at the spacing shown on the Plans. Resilient adaptability of salt marsh grasses requires interplanting of high and low marsh species. Plan areas indicating species are diagrammatic for the purpose of quantifying materials but will be interplanted at their transitional edge per field direction. Discrepancies shall be resolved by the Wetland Specialist in consultation with the Wetland Specialist and MassDOT Landscape Design Section.

Plant material shall be installed as soon as possible after delivery. Plants stored onsite prior to planting shall be maintained in acceptable condition as described in materials section. Plants showing signs of stress or compromised health may be rejected by the Engineer or Wetland Specialist with replacement at the Contractor's expense.

Plants shall be installed at a depth to prevent dislodging through the tide cycles and as shown on the Plans. Firmly backfill hole by hand with the planting substrate to prevent dislodging from tidal action. There is potential for air pockets especially when planting in an existing peat substrate; care shall be taken not to leave air pockets in the planting hole. Stepping on the planting hole to backfill may cause stems to break and is not an acceptable practice.

Mulch shall not be used for plantings within the intertidal zone below the High Tide Line (spring high tide) line.

Plants installed within the intertidal zone, or range of normal tidal flooding, shall not require additional watering after installation.

Herbaceous Plants:
Installation of herbaceous plants shall occur within the planting window of May 1 to June 30. Planting outside of these dates shall require written approval from the Engineer in coordination with the Wetland Specialist and MassDOT Landscape Design Section. Planting holes shall be 6-8 inches deep and of sufficient width to accept plugs or peat pots.

Woody Plants:
Plants shall be removed from the container or burlap covering and set in the hole so that the top of the root ball is level with the surface of the ground. Care should be taken to keep the root ball intact while handling. Circling or girdling roots shall be untangled to promote spreading growth.

Goose Fence:
Goose fence shall be installed as perimeter protection for salt marsh mitigation areas prior to planting and according to the Plans. The Contractor shall ensure that the goose fence is maintained and wetland plantings are not grazed or disturbed by geese throughout the duration of the Establishment and Planting Guarantee Period. Any plants damaged or lost due to inadequate protection shall be replaced at the Contractor's expense.

Goose Fence shall consist of UV-stabilized polypropylene netting secured to stakes in order to enclose the tidal wetland planting area and prevent geese from flying, swimming or walking into the area. Wetland planting areas shall be divided by Goose Fence into sections no greater than 48 feet by 48 feet. The top of netting shall be at or above Mean High High Water (spring high tide) elevation to prevent geese from swimming into planting areas. A network of overhead lines shall be installed to prevent geese from flying into planting areas. Bird repellent ribbon shall be attached to the overhead lines and top edge of netting to warn birds of the obstructions.

The Contractor shall remove and properly dispose of all Goose Fence materials at the end of the second growing season after plants enter dormancy or as directed by the Resident Engineer.

Mitigation Performance Standards:
The Contractor shall fulfill the following minimum Mitigation Performance Standards for the Mitigation Areas within a Planting Guarantee Period of two (2) full growing seasons after Final Acceptance of plantings. Monitoring shall be performed by the Wetland Specialist as described below.

1. MassDOT is responsible for reestablishing success of ~ 2,677 sf the replacement area to a 1:1 ratio within of the site within two growing seasons.
2. The target elevations for Mitigation Areas and planting types have been met and maintained. A minimum of 90% of each wetland mitigation area must meet desired hydrology. Areas that are too high or too low should be identified along with suggested corrective measures.
3. Establish at least 75% uniform cover of the intended herbaceous wetland plant community.
4. Establish at least 95% of woody plants installed.

Plant species listed as invasive by Massachusetts Invasive Plant Advisory Group (MIPAG) and the USACE – New England District shall be identified as such in the monitoring reports and corrective measures taken to control them within the limits of the Mitigation Areas for the duration of the Planting Guarantee Period.

If at the end of the Planting Guarantee Period, the Mitigation Performance Standards have not been met according to the monitoring report, the Contractor shall provide corrective measures and install replacement plant material to achieve the required establishment. All costs associated with achieving the Mitigation Performance Standards through the Planting Guarantee Period shall be incidental to this item.

As-Built Drawings:
Following acceptance of the planting by MassDOT, as-built drawings of the Wetland Mitigation Areas shall be surveyed and prepared as per the USACE - New England District's Compensatory Mitigation Guidance. As-built drawings shall be prepared at a clearly legible scale including 1-ft. contours and polygons outlining each wetland mitigation area. The as-built drawings shall serve to confirm that area requirements have been met and as the base map for mitigation monitoring. The as-built drawings shall be provided in printed paper format (full size 30" x 42" sheets) as well as Portable Document Format (e.g., Adobe PDF) and AutoCAD files on compact disk. As-built drawings shall be completed within 30 days of acceptance of initial wetland mitigation planting.

Final Acceptance:
Final acceptance of work under this item shall be contingent upon the following.

a. Completion of wetland work and Final Site Inspection by Engineer and Wetland Specialist.
b. Completion and acceptance of As-Built Drawings by the Engineer and Wetland Specialist.

Monitoring and Maintenance:
Monitoring shall be performed by the Wetland Specialist in order to ensure compliance with the Mitigation Performance Standards. Monitoring methods and report content shall conform to the Wetland Mitigation Report as approved by the regulatory agencies. The monitoring schedule shall be as per scope of work for Wetland Specialist. Work performed by the Wetland Specialist shall be according to and paid for separately and is not included in this item.

Based on monitoring results and as directed by the Engineer in consultation with the MassDOT Environmental and Landscape Design Sections, the Contractor shall make corrective measures to achieve compliance with the Mitigation Performance Standards. All plants not showing satisfactory evidence of establishment during the Planting Guarantee Period shall be replaced within the appropriate planting window. Unsatisfactory plants shall be removed and replaced along with dead and missing plants.

Maintenance of Mitigation Areas shall include replacement of dead or missing plant material, maintaining goose fence in effective and satisfactory condition, removal of debris within and around perimeter of Mitigation Area, correcting unintended ponding, erosion and gullies. Goose Fence shall be maintained in tidal Mitigation Areas for at least two full growing seasons. If tidal wetland plants are replaced, goose fence shall be maintained or be re-installed to protect seedlings from foraging for two full growing seasons. All maintenance shall be incidental to this item.

Basis of Payment

Within 10 days of the award of the contract, the Contractor shall submit, in duplicate, for approval by the Engineer, a schedule of unit prices and amounts for the major components of the Mitigation Areas as listed on the following table. The cost of labor and materials for any item not listed but required to complete the work under this item shall be considered incidental to the item and no further compensation will be allowed.

Item Component	Quantity SM	Unit	Unit Price	Amount
Combination Protection Fence	XX	FT	$	$
Goose Fence	XX	FT	$	$
Coarse Sand	XX	CY	$	$
Prunus maritima – 18-24 IN	XX	EA	$	$
Baccharis halimifolia – 18-24 IN	XX	EA	$	$
Salt marsh grass 2-inch plugs	XX	EA	$	$
Saltmeadow cordgrass 2-inch plugs	XX	EA	$	$
American beachgrass 2-inch plugs	XX	EA	$	$
Bitter Panicgrass Seed / Oat Cover	XX	EA	$	$

*Note: Quantities for salt marsh restoration area have been roughly estimated. Actual quantities shall be determined in the field by the Wetland Specialist after impacts to existing vegetation from the temporary bridge have been assessed.

Work for Item 755.2 TIDAL WETLAND MITIGATION AREAS shall be measured and paid at the contract bid price per square yard, which price shall include full compensation for work herein.

Such payment shall be considered full compensation for all labor, tools, equipment, materials, travel and incidentals necessary to complete the work as described herein and in a manner satisfactory to the Resident Engineer.

PAYMENT SCHEDULE
75 percent paid upon Final Acceptance.
25 percent paid at end of Planting guarantee period.