Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Monica Tibbits-Nutt, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

September 30, 2024

605311-128035

ADDENDUM NO. 1

To Prospective Proposers and Others on:

MARION-WAREHAM
FAP No. HIP(NGB)-003S(786)X
Bridge Replacement, M-05-001=W-06-013 & W-06-016, Marion Road/Wareham Road (Route 6) over Weweantic River
Design-Build

TECHNICAL & PRICE PROPOSALS DUE: Thursday, December 19, 2024, by 2:00P.M.

Transmitting revisions to the RFP Documents as follows:

RFP Volume I of III – Instruction to Proposers (August 21, 2024)
Revised page 57.

RFP Volume II of III – Technical Provisions (August 21, 2024)
Revised pages iii, ix, x, xi, 49, 71, 81, 87, 88, 89, 92, 93, and 96.

Modified the RFP Appendix folder as follows:

\Appendix\C\C.01\
Inserted new file: 605311 Highway.zip

\Appendix\C\C.04\
Inserted new files:
MassDEP 401 WQC Amendment 09-26-2024 A-1.pdf
USCG Advance Approval Application Request 12-27-2023 A-1.pdf
USCG BridgeCompletionRPT_4599 A-1.pdf
USCG-MassDOT Advanced Approval Request_12-01-2023 A-1

\Appendix\C\C.08\
Inserted new file: Marion_Wareham_Draft Hydraulic Rpt A-1.pdf
(Note: Final Stamped Hydraulic Report to be issued in a future Addendum)

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
mass.gov/massdot

ADDENDUM NO. 1

Please take note of the above, substitute the revised pages for the originals, insert the new files into the proper folder, and acknowledge Addendum No. 1 in your Expedite Proposal file before submitting your bid.

Sincerely,

Eric M. Cardone Digitally signed by Eric M. Cardone Date: 2024.09.30 15:45:04 -04'00'

Eric M. Cardone, P.E.
Construction Contracts Engineer

EMC\ltp
cc: Narayana Kolla, P.E., Manager Alternative Procurement and Delivery
Valerie Kilduff, P.E., Design-Build Project Manager

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5.6 DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION

Disadvantaged Business Enterprises (DBEs), as defined by 49 CFR 26, shall have the opportunity to participate in the performance of Design-Build Contracts financed in whole or in part with Federal funds.

The DBE participation Goal for this Project is as follows:

① • DBE firms perform no less than fourteen (14%) percent of design services.

① • DBE firms perform no less than fourteen (14%) percent of construction services. A minimum of one-half of the goal for construction shall be met in the form of construction activity. The DBE participation goal shall remain in effect throughout the life of the Contract.

Each Proposer is required to identify in its Proposal the DBE(s) selected and work to be performed by each DBE. DBE participation to be counted toward the goal must be in the form of independent work and DBE firms must be certified by the Massachusetts Supplier Diversity Office ("SDO"), formerly known as the State Office of Minority and Women Business Assistance (SOMWBA), at the time of the Proposal."

If MassDOT finds that the percentage of DBE participation submitted by the Proposer will not meet the DBE goal of the Contract and that the Proposer has not made good faith efforts to meet the goal, MassDOT may, at its discretion, cease all further action with the Proposer.

Certified Disadvantage Business Enterprises (DBEs) may be located at https://www.diversitycertification.mass.gov/BusinessDirectory/BusinessDirectorySearch.aspx

DBE Special Provisions are included in RFP Volume I, Attachment C. Forms B00853 and B00854, included in Attachment C, must be submitted in accordance with Document 00719 for both design **and** construction participation goals.

Address questions regarding DBE requirements to:

Darnell L. Williams
Deputy Chief Diversity Officer - External Programs
MassDOT Office of Diversity and Civil Rights (ODCR)
10 Park Plaza, Room 3800
Boston, MA 02116-3973
Telephone: (617) 872-6497
Email: Darnell.Williams@dot.state.ma.us

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APPENDIX A: TERMS AND DEFINITIONS

APPENDIX B: WAGE RATES FOR STATE AND FEDERAL PROJECTS

APPENDIX C: PROJECT REFERENCE DOCUMENTS

C.01 BASE TECHNICAL CONCEPT

- 605311_M-05-001=W-06-013 - CAD.zip
- 605311_W-06-016 - CAD.zip
- ① 605311 Highway CAD.zip
- 605311_BTC_HIGHWAY PLANS
- 605311_BTC_BRIDGE PLANS M-05-001=W-06-013
- 605311 BTC BRIDGE PLANS W-06-016

C.02 VALUE ENGINEERING STUDY - [NOT APPLICABLE]

C.03 CIVIL

- 605311Accepted Right of Way Plans
- 605311Functional Design Report
- 605311Design Justification Workbook
- 605311Stormwater Management Report
- 605311-25% Water Quality Data Form (WQDF)
- A00815-Maint Contracts Work-Zone-Safety-December 2017 (Flip Book)
- A00816 Rumble Strip Details
- Work Zone Speed Limits – MassDOT S.O.P. No. TS-2023-002
- A00808 MassDOT Project Utility Coordination (PUC) Form

C.04 ENVIRONMENTAL

- Approved Environmental Permit Plans
- Wetland Replication-Mitigation Plan_Jan19_2024
- Coastal Zone Management Office Consistency
- MassDEP 401 Water Quality Certification (WW BRP 8 and 10)
- ① MassDEP 401 Water Quality Certification Amendment 09-26-2024
- NEPA Approved Individual CE
- Natural Heritage and Endangered Species Program (NHESP) MESA Conditional No-Take (24-17064)
- NOAA Essential Fish Habitat Conservation Recommendations
- NOAA Essential Fish Habitat MassDOT Acceptance
- NOAA Essential Fish Habitat – Final Coordination Approval
- NOAA Section 7 Coordination Concurrence
- Section 106 Historic and Cultural No Effect Finding and Clearance

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C.04 ENVIRONMENTAL (Continued)

- United State Army Corps of Engineers (USACE) Section 404 Individual Authorization (NAE-2023-00894)
- USFWS Section 7 NLAA Consistency Letter Marion Wareham 605311
- ① United States Coast Guard (USCG) Advanced Approval - MA 16590 01-17-2024
- ① USCG - MassDOT Request for Advanced Approval _12-01-2023
- ① USCG - MassDOT Request for Advanced Approval Questionnaire Application 12-27-2023
- ① USCG - Bridges over Navigable Waters Completion Report (CG-4599)
- 605311 Early Environmental Coordination Checklist
- EECC Hazardous Materials Memo

C.05 EXISTING CONDITIONS & RECORD PLANS

- W-06-016 US 6 over Weweantic River – 1926
- W-06-016 US 6 over Weweantic River - 1956
- M-05-001 US 6 over Weweantic River - 1901
- M-05-001=W-06-013 US 6 over Weweantic River – 1929
- M-05-001=W-06-013 US 6 over Weweantic River - 1956

- Record Highway Plans
  - N4 – 1958 Marion RD Briarwood Drive

- Record Utility Plans
  - River Road Watermain
  - National Grid Marion St – Briarwood Drive
  - Comcast Systems Maps Route 6 over Weweantic River

- Record SHLO Plans
  - SHLO 4354 SH-1
  - SHLO 4355 SH-1

- SHLO 4355 SH-2
  - SHLO 4355 SH-3
  - 1997 SHLO 7386
  - PB 10 PL 766_River Road Subdivision

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C.06 GEOTECHNICAL

- 605311 Geotechnical Data Report Bridge No. M-05-001 = W-06-013, W-06-16 and the Causeway over Weweantic River Sept, 2024

C.07 [NOT APPLICABLE]

C.08 HYDRAULICS

① - Draft Hydraulic Report 9-19-2024

C.09 SPECIAL PROVISIONS

- 00713-SubSection 701-Cement Concrete SW-PedCurbs-Driveways 3-31-22
- 00715 Supplemental Specifications 6-30-24
- A00801 Draft BTC Special Provision (To be issued by Addendum)
- A00810 MassDOT Herbicide Use Report 7-18-2018
- Watering Log for MassDOT Plantings

C.10 STRUCTURAL

- Bridge Rating Reports
  - Marion SI&A
  - Rating Report M-05-001-45E g180
  - Rating Report W-06-016-45K g180
- Inspection Reports
  - M05001 10-16 Inspection Photo 13 of Steel Conduit
  - W06016 10-16 Inspection Photo 34 of Steel Pipe
  - W06016 10-16 Inspection Photo 35 of Steel Pipe
  - Routine Inspection M-05-001 10-16
  - Routine Inspection W-06-016 10-16
  - Underwater Inspection M-05-001
  - Underwater Inspection W-06-016

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4.3.2 ATC Restrictions

ATCs will be evaluated and either accepted or rejected per guidelines presented in Volume 1 of the RFP. The Design-Builder shall provide a design in all ATCs presented to the Department that is equal to or better than the BTC design it intends to supersede. The following is a list of ATC restrictions.

① • Any ATC reducing the vertical clearances below Route 6 over the Weweantic River.

① • Any ATC that proposes a steel superstructure.

• Any ATC reducing the horizontal clearances of the Weweantic River.

• Any ATC which incorporates the re-use of existing substructure elements for a permanent structure.

① • Any ATC where Mechanically Stabilized Earth (MSE) Modular or other wall type is used and whose primary design is as an earth retaining structure, and the superstructure is not supported on an independent deep foundation.

① • Any ATC where a modular wall abutment is proposed, and the abutment beam seat is not cast integrally with the top module as indicated in AASHTO Section 11.11.7.

• Any ATC which proposes GRS-IBS structures.

• Any ATC which proposes “lean on bracing”.

• Any ATC which does not maintain the required number of vehicular lanes and shoulder dimensions in the final condition on Route 6 shown in the BTC.

• Any ATC that does comply with the proposed low chord identified in the USCG Advanced Approval.

• Any ATC which does not maintain the required Shared Use Paths in the final condition on Route 6 shown in the BTC.

• Any ATC using precast butted box beams or partial depth precast deck panels.

• Any ATC which incorporates lightweight concrete on the bridge deck and/or CF-PL3 or CP-MTL3 barriers.

• Any ATC which does not allow for continuous two lanes of traffic, one in each direction on Route 6 during construction except where allowed in Section 4.9.1.

• Any ATC which does not allow for continuous access to abutting properties except where allowed in Section 4.9.1.

• Any ATC which does not achieve a minimum 45 mph design speed on temporary roadway configurations carrying Route 6. Short term lane shifts and tapers for lane closures on Route 6 shall meet or exceed 55 mph design speed.

• Any ATC will comply with the proposed low chord identified in the USCG Advanced Approval.

• Any ATC that does not maintain the roadway cross section provided in the BTC in the final condition.

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4.9.4 Guardrail and Substructure Protection Barrier

The Design-Builder shall replace the existing highway guardrail with new guardrail conforming to the latest AASHTO MASH requirements within the limits of work.

4.9.5 Bicycle Lanes and Bicycle Accommodations

The Design-Builder shall construct Shared Use Paths no less than that shown in the BTC plans. The bicycle and pedestrian accommodations will need to meet the specifications and requirements of the 2012 AASHTO Guide for the Development of Bicycle Facilities, the MassDOT Project Development Design Guide Book as well as the MassDOT Separated Bike Lane Planning & Design Guide and will need to be approved by MassDOT.

4.9.6 Temporary Barrier Systems for Construction and Maintenance Operations

The Design-Builder shall utilize MASH performance requirements for deployments of temporary barrier per Engineering Directive E-16-002 and E-20-004.

Refer to the Draft BTC Special Provision Subitem 853.33 Temporary Barrier-Limited Deflection (TL-3) barriers provided in Appendix C for additional requirements.

① ### 4.9.7 Pedestrian Hybrid Beacon

The Design-Builder shall construct permanent Pedestrian Hybrid Beacon at two locations within the Project limits as shown in the BTC plans.

Refer to the Draft BTC Special Provisions Subitem 824.41 Pedestrian Hybrid Beacon in Appendix C for additional requirements.

4.10 BRIDGE DESIGN AND OTHER STRUCTURES

4.10.1 General

MassDOT is proposing to replace the following bridges:

- Route 6 (Wareham/Marion Road) over the Weweantic River – Bridge No. M-05-001=W-06-013 (45E & 9TV)
- Route 6 (Marion Road) over the Weweantic River – Bridge No. W-06-016 (45K)

The Design-Builder shall design, demolish, and construct the above structures and make the Project fully functional in accordance with all contract requirements.

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Superstructure:

- All bridge wearing surfaces shall be designed in accordance with Section 4.8.3.2.
- ① Any bridge deck on which traffic will be placed shall receive the full 3 1/4" pavement (wearing and protective course). The 1 3/4" surface course shall be milled and paved once traffic is in the final alignment before final striping. If bolt down barrier is used on bridge decks, deck details shall be included for restoring the deck, waterproof membrane and overlay on the structure for the final condition following removal of the bolted down temporary barrier.
- Bridge decks shall be HP concrete in accordance with the MassDOT LRFD Bridge Manual. The decks shall be composite along their entire lengths including any negative moment regions.
- Open or filled grating decks, cast-in-place bare decks, partial depth concrete deck panels and orthotropic decks shall not be permitted.
- Cast-in-place bridge decks shall be made continuous through each stage of construction by utilizing mechanical reinforcing bar splicers or adequately developed bars extending from one stage to the next.
- Stay-in-place metal deck forms shall be used except as noted in Section 3.5.2.4 of the MassDOT LRFD Bridge Manual.
- Adjacent concrete boxes are to not be used for any superstructure type within this Project. However, spread boxes with standard composite decks are allowed.
- The Design-Builder shall provide a structural design for the moment slab supporting the traffic barriers on the approach embankment of all bridges if proposed. The design shall consider any additional loads resulting from all roadway light poles, sign support haunches, etc. in addition to the dead and vehicular loads in accordance with AASHTO LRFD Bridge Design Specifications.
- The Design-Builder shall not modify the basic structure widths beyond limits previously stated (Section 1.1.1.) from those provided in the BTC. A bridge barrier shall be provided to separate the shared use paths from the roadway on all structures.
- For bridges carrying utilities, the Design-Builder shall place all utilities as shown on the BTC plans or as approved by the utility companies and MassDOT. The utility bays shall be designed by the Design-Builder per the MassDOT LRFD Bridge Manual. Proposed utilities shall not extend below the low chord of the proposed bridges. The bridge type should take into consideration the proposed utilities. The Design-Builder shall provide a removable approach slab on all approaches for bridges with a proposed or future utility bay in accordance with the Bridge Manual. The Design-Builder shall brick up all backwall utility penetrations after utility installation.
- Both bridges shall be a consistent superstructure type.

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4.10.12 Bridge Temporary Works

The Design-Builder is responsible for the means and methods of construction for all elements within the construction contract including temporary access. Temporary work required for construction shall be designed, implemented, and removed by the Design-Builder. The Design-Builder shall submit structural or fill/embankment designs, stamped by a Registered Professional Engineer in the Commonwealth of Massachusetts, to the Design Engineer and Engineer for review. Temporary structure designs may include temporary trestles/work platforms and erection supports. Temporary structure design shall be in accordance with AASHTO including *AASHTO Guide Design Specifications for Bridge Temporary Works*. Upon removal of the Temporary Works the affected areas must be restored to the original condition.

The Design-Builder may utilize any method of access to the project site as detailed in the environmental permit documents. Alternative method or techniques for temporary works may be considered and will be the Design-Builder's responsibility to maintain such procedures, methods and techniques within compliance of the Environmental Permits. Any deviations from the approved permit plans that will introduce new impacts to resource areas will require permit amendment approvals to be obtained by the Design-Builder. Any alternative methods deviating from the BTC suggested temporary works proposed by the Design-Builder, regardless of whether they have any environmental impacts, shall be submitted as part of the RFP Technical Proposal submission and concept plans.

4.10.13 Retaining Walls

4.10.13.1 **Retaining Wall Design Criteria**

① As shown on the BTC plans, retaining walls are proposed to support the causeway from the widened roadway and will have the added benefit of serving as a turtle protection barrier. The design of the Post and Panel walls is coupled to the lightweight fill ground improvement, and both contribute to increasing the global stability factor of safety (FOS) to an acceptable level while allowing for widening and increasing the grade of the causeway and reducing settlement. Soldier piles for the BTC Post and Panel walls would be installed in predrilled temporarily cased holes backfilled with concrete to the bottom of the concrete panels. It is anticipated that predrilling or pile installation would not occur until after excavation to remove existing rip-rap and other obstructions down to the lightweight fill subgrade elevation.

1. Final retaining wall design for all walls shall be completed by the Design-Builder in accordance with AASHTO Section 11 for both internal (structural) stability and external stability (including sliding, overturning, bearing resistance, settlement, and short-term and long-term overall stability) for each of the wall structures. For specialty wall types, the final design calculations shall be performed by the specialty wall designer, stamped by a Professional Engineer licensed in Massachusetts, and be approved by the Designer of Record.

① 2. Wall panel embedment shall be based on wall type but should be a minimum of 4 feet below ground adjacent surface, or deeper if needed to satisfy external stability frost and requirements, unless founded on bedrock. The Design-Builder shall consult wall manufacturers and standard design guides for embedment depths.

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3. The Design-Builder shall use the same wall type within a continuous stretch of wall. Continuity of wall appearance throughout the Project site is also desired for aesthetic continuity.

4. In locations where existing and proposed utilities are located, the Design-Builder shall coordinate with the utility company prior to selecting a wall type in order to accommodate the potential for any utility openings or supports on the walls or any external reinforcements/straps/anchors.

5. Wall drains shall be determined by the Design-Builder based on wall type and shall conform to the wall manufacturer's specifications if a proprietary wall system is used.

6. The Design-Builder will maintain roadway drainage throughout construction of the retaining walls for all walls spanning over or adjacent to waterways (culverts, streams, rivers, ponds, etc.) to assure no untreated drainage enters the waterways

7. .Surface treatment of the retaining walls shall have form finish or concrete facing .

8. Gabion walls, metal bin walls, and concrete masonry unit (CMU) block walls, and MSE walls are not accepted walls to be used on this Project.

4.11 GEOTECHNICAL

The following section shall apply to all Project elements. Refer to Section 4.10, for additional geotechnical information and requirements related to the bridges.

4.11.1 General

Preliminary geotechnical explorations have been conducted for this Project, including the two bridges and associated approaches and causeway. A Geotechnical Data Report (GDR) has been prepared for each of the two bridges and a separate report has been prepared for the associated causeway embankment. These reports show the soil conditions at multiple locations within the Project limits in support of the BTC. This document is provided in Appendix C. The Design-Builder shall review and accept the provided Geotechnical Data Report and other geotechnical documents.

The Final Geotechnical Reports shall be based on the provided Geotechnical Data Report and any further geotechnical investigation conducted by the Design-Builder and shall be completed by the Design-Builder as part of this RFP and at no additional cost to MassDOT.

The Design-Builder shall perform additional geotechnical investigations, testing, research, and other measures appropriate to comply with the minimum standards in the latest MassDOT LRFD Bridge Manual and AASHTO LRFD Bridge Manual. The Design-Builder shall prepare Final Geotechnical Reports for each bridge structure and a separate report for all Highway Elements. ①

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The Design-Builder shall ensure the geotechnical investigations and analyses are both thorough and complete, so as to provide accurate information for the design and construction of roadways, pavements, foundations, structures, and other facilities that result in a Project that is safe and meets operational standards and final acceptance requirements.

The Design-Builder shall be responsible for all grading and related work such as remedial excavation and embankment/foundation settlement monitoring required for construction of the Project. No grading operations and foundation construction for the Project shall commence until the Geotechnical Report(s) for the area of grading and foundation construction has been approved by MassDOT and, as applicable, local agencies.

The Design-Builder shall design all bridge foundations such that unsuitable/organic soils are removed, bypassed, or improved. The Design-Builder shall design causeway embankment widening and grade increase to meet all settlement, stability (including global stability) requirements using lightweight fill and/or structural support walls. The Design-Builder may use ground improvement techniques to improve poor ground conditions when traditional over-excavation and replacement is not feasible for environmental, technical, or economic reasons. Ground improvement methods must meet the limitations provided herein.

4.11.2 Use of Geotechnical Information

The Design-Builder shall use the subsurface information and all Reference Documents provided in Appendix C at their own risk. While the MassDOT provided information does identify subsurface conditions at the exact location of specific borings, test pits, probes, and/or geophysical lines, any further interpretations of subsurface conditions beyond or in addition to that information are the Design-Builder's sole responsibility.

It is the responsibility of the Design-Builder to review soil samples and rock cores from the subsurface explorations, which are located at the MassDOT Storage Facility in Lawrence, MA.

4.11.3 Subsurface Investigations by the Design-Builder

Subsurface explorations shall be conducted for any new and modified structures so that the requirements of AASHTO LRFD Bridge Design Specifications Article 10.4 and Table 10.4.2-1, MassDOT's LRFD Bridge Manual and the requirements below are met. The BTC plans show borings based on assumed structures and span arrangements. Any changes to this may require additional borings as needed to meet the requirements of AASHTO LRFD Bridge Design Specifications, MassDOT's LRFD Bridge Manual, and the requirements below. The Design-Builder acknowledges that it may be necessary to supplement the existing subsurface information, and that MassDOT may require additional borings, test pits, probes, geophysical surveys or cone penetration tests in connection with any of MassDOT's reviews.

- If an ATC proposes to shift a substructure (piers or abutments) and its proposed location is more than 15 feet away from BTC boring locations, additional borings are required.
- If an ATC proposes to shift a substructure (piers or abutments) and its proposed location is within 15 feet of the BTC boring locations, additional borings are not required.
- A minimum of two borings, drilled within 15 feet of the substructure, are required at each end of proposed pier and abutment locations regardless of the pier width.
- ① Perform construction phase borings along the proposed retaining wall alignment. Refer to Special Provision Subitem 190.01 Borings. Design-Builder to identify additional boring locations along wall alignment based on final retaining wall design.

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For the evaluation of embankments, slopes and walls, analysis shall include the following (as applicable): bearing resistance, settlement, sliding, maximum eccentricity (overturning), and overall global stability.

①

4.11.6 Bridge Foundations

The Design-Builder is responsible for the analysis, design, and construction of the bridge abutments, piers, and their foundations. All design calculations must be in accordance with AASHTO LRFD and the MassDOT Bridge Manual. See Section 4.10 for additional information specific to bridge foundations.

Bridge foundations which are located behind retaining walls shall be independently supported on deep foundations.

Where any proposed subsurface steel elements are exposed to soil and groundwater (not embedded in a pile cap), the Design-Builder shall conduct corrosion testing of the soils at that structure to determine an appropriate sacrificial thickness for the corrosion allowance for the steel elements to retain minimum required capacity for the entire 75-year project design life. This includes all exposed surfaces of driven piles and permanent casing for drilled foundations. Irrespective of the results of the testing, a minimum corrosion allowance of 1/16" over 75 years, or 0.00083 inches/year, shall be used for design.

The Design-Builder shall provide Quality Assurance and Control guidance for the installation of proposed deep foundation elements following the latest accepted industry standards to assess plumbness and movement tolerances. Installation records shall be submitted to MassDOT after completion of bridge foundations.

As-built foundation data on substructure elements that will be reused and/or abandoned in place and which differs from the original design plans shall be revised on the final plans. This shall include information such as plan locations, additional piles or shafts, changes in diameter, tip elevation, and/or bottom of footing elevation.

Drilled Shafts

The design of Drilled Shafts shall be in accordance with Geotechnical Engineering Circular No. 10 - Drilled Shafts: Construction Procedures and LRFD Design Methods FHWA-NHI-18-024.

If Drilled Shafts are proposed, shafts shall be socketed into bedrock and all axial resistance shall be derived from the bedrock, without consideration of overburden soils. Drilled shaft lateral resistance may be derived from soil below the depth of scour and bedrock.

One (1) Bi-directional Axial Compressive Load Test must be completed on a sacrificial (non-production) drilled shaft. The Bi-directional Load Test (previously known as the Osterberg Test) shall be loaded to failure to determine nominal side and tip resistances in the rock socket. The location of the Trial Drilled Shaft is to be performed near one of the abutments of Bridge M-05-001=W-06-013

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① The minimum scope of work outlined in Draft BTC Special Provision Subitem 945. for inspection of the bottom of the shafts using a shaft inspection device is a requirement of the Project."

Refer to Draft BTC Special Provision Subitem 945.01 for additional drilled shaft installation and testing requirements.

See NOAA Section 7 Programmatic approval for other requirements related to “soft starts.”

4.11.7 Ground Improvement

Through a variety of ground treatment methods and geo-construction technologies, weak and unsuitable in-situ soils can be improved to meet specific Project requirements, thus making this alternative method a safe and potentially economical solution.

Design and construction of ground improvement techniques shall be done in accordance with the Ground Modification Methods Reference Manual FHWA-NHI-16-027 and FHWA-NHI-16-028. The manual introduces the web-based GeoTechTools (http://www.geotechtools.org) which is a decision-making tool that identifies many geotechnical solutions for design and construction of embankments on soft soils, embankment widening, and pavement foundations. These tools help select and apply the most appropriate method to the site-specific problems and conditions.

The Design-Builder may consider the following ground improvement techniques for unsuitable/organic soils located below proposed roadway embankments and retaining walls.

1. Lightweight Fills: Reduce settlement and/or improve stability of embankments located above deep unsuitable soil which can’t be excavated. Only the fills listed below may be considered for this project.
    - Geofoam – expanded polystyrene (EPS)
    - Low density cellular concrete (LDCC), also known as foamed concrete
    - ①
    - Expanded shale, clay and slate (ESCS)
    - Foamed Glass Aggregate (FGA)

If used, geofoam shall be fully encapsulated with a petroleum resistant membrane.

The selected lightweight fill type shall be proven suitable for use in a marine environment over the design life of the project. The lightweight fill must also be placed with sufficient soil cover as to not be buoyant during extreme flooding events.

2. Aggregate Columns: Increase bearing resistance of underlying soil, reduce settlement, improve slope stability, and reduce liquefaction potential of soil. Aggregate columns shall not be used to support the bridges. Vibro-replacement or Vibro-displacement may be used. Unless Aggregate Columns are used to mitigate liquefaction, an engineered load transfer platform (LTP) will be needed to transfer loads uniformly to the underlying improved soils. Due to the presence of organic soils onsite, aggregate piers, if used, would need to be fully grouted.

4.12 BRIDGE HYDRAULICS AND SCOUR

Hydrologic, hydraulic, and scour analyses were prepared by HDR and submitted to MassDOT to support the proposed Bridges (M-05-001=W-06-013 (CBJ) Route 6 (Wareham/Marion Road) and W-06-016 (CBH) Route 6 (Marion Road) over the Weweantic River for BTC development and permitting. The analyses evaluated existing and proposed conditions at the bridge crossings over Weweantic River using current standard of practice computer modeling and computational procedures. Scour analyses were performed to calculate contraction, abutment, pier, and total scour depths set forth in AASHTO LRFD Bridge Design Specifications. The analyses also serve to support FEMA regulation compliance (No-Rise). The report is provided in appendix C and is considered a final version for use by the Design-Builder.

In the event the Design-Builder makes changes to the hydraulic characteristics of either bridge crossing, as shown in the BTC, based on approved ATC's or design development, the Design-Builder shall prepare and submit an amended Hydraulic and Scour Analysis Report for Bridges M-05-001=W-06-013 (CBJ) and W-06-016 (CBH) using the same coastal and riverine hydraulic modeling used in the original report and in accordance with the guidelines specified in the MassDOT LRFD Bridge Manual. For this Project, the use of the MassDOT LRFD Bridge Manual guidelines, edition 2013 with 2020 revisions, used for the HDR hydraulic analysis will be acceptable. The modeling files that were developed by HDR will be available to the selected Design-Builder. Please note that HDR coastal team used MIKE21 Spectral Waves FM (SW) and MIKE21 Flow Model FM. Both models are developed by DHI. Also, the bridge hydraulic analysis used SRH-2D version 3.6.5 and SMS version 13.3.10.

Amended hydraulic analysis shall be in conformance with the Bridge Manual procedures as noted above and shall be performed consistent with the assumptions and design criteria as included in the original report. Changes to the amended analysis design criteria used are subject to MassDOT review and acceptance. The amended final report should include, but not be limited to, all updates of the final design that influence the calculations, determination of the hydraulic design elevations and flow, potential scour depths, and all other hydraulic analysis to support the final design. The amended hydraulic analyses should also re-examine compliance with applicable FEMA regulations.

Depending on the method of construction for the proposed work on the Project, the Design-Builder shall also provide additional hydraulic analysis for any proposed temporary water control measures that would impact water flow.

Submitted hydraulic reports shall be prepared and approved by a Professional Engineer licensed in the Commonwealth of Massachusetts. These hydraulic analyses and scour analyses will require review by MassDOT prior to the acceptance of the Design Documents or any early construction start that may influence water flow at each bridge location.