JPB

COMMONWEALTH OF MASSACHUSETTS



CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

PROPOSAL NO.	608491-131468
P.V. =	$17,857,000.00
PLANS	YES

FOR

Federal Aid Project No. NHP(NHS)-003S(866)X
Resurfacing and Related Work on Route 16

in the Town of

MENDON

In accordance with the STANDARD SPECIFICATIONS
for HIGHWAYS and BRIDGES dated 2025

This Proposal to be opened and read: **TUESDAY, AUGUST 19, 2025 at 2:00 P.M.**

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DOCUMENT 00104

NOTICE TO CONTRACTORS

Electronic proposals for the following project will be received through the internet using www.bidx.com until the date and time stated below and will be posted on www.bidx.com forthwith after the bid submission deadline. No paper copies of bids will be accepted. All Bidders must have a valid vendor code issued by MassDOT in order to bid on projects. Bidders need to apply for a Digital ID at least 14 days prior to a scheduled bid opening date with www.bidx.com.

TUESDAY, AUGUST 19, 2025 at 2:00 P.M. **
MENDON
Federal Aid Project No. NHP(NHS)-003S(866)X
Resurfacing and Related Work on Route 16

****Date Subject to Change**

PROJECT VALUE = $17,859,000.00

Bidders must be pre-qualified by the Department in the HIGHWAY - CONSTRUCTION category to bid on the above project. An award will not be made to a Contractor who is not pre-qualified by the Department prior to the opening of Proposals.

All prospective Bidders who intend to bid on this project must obtain "Request Proposal Form (R109)". The blank "Request Proposal Form (R109)" can be obtained at: https://www.mass.gov/prequalification-of-horizontal-construction-firms.

All prospective Bidders must complete and e-mail an electronic copy of "Request Proposal Form (R109)" to the MassDOT Director of Prequalification for approval: prequal.r109@dot.state.ma.us.

Proposal documents for official bidders are posted on www.bidx.com. Other interested parties may receive informational Contract Documents containing the Plans and Special Provisions, free of charge.

Bids will be considered, and the contract awarded in accordance with statutes governing such contracts in accordance with Massachusetts General Laws Chapter 30 § 39M.

The Project Bids File Attachments folder for proposals at www.bidx.com shall be used for submitting at the time of bid required information such as the Bid Bond required document, and other documents that may be requested in the proposal.

NOTICE TO CONTRACTORS (Continued)

All parties who wish to have access to information plans and specification must send a "Request for Informational Documents" to MassDOTBidDocuments@dot.state.ma.us.

A Proposal Guaranty in the amount of 5% of the value of the bid is required.

This project is subject to the schedule of prevailing wage rates as determined by the Commissioner of the Massachusetts Department of Labor and Workforce Development, and the Division of Occupational Safety, and the United States Department of Labor.

The Massachusetts Department of Transportation, in accordance with Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby affirmatively ensures that for any contract entered into pursuant to this advertisement, all bidders, including disadvantaged business enterprises, will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin in consideration for an Award.

This Proposal contains the "STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)". The goals and timetables applicable to this proposal for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all work, are contained in Appendices A and B-80 of the above specifications.

The Contractor (hereinafter includes consultants) will comply with the Acts and Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this Contract as contained in Appendices C and D of the above specifications.

NOTICE TO CONTRACTORS (Continued)

PRICE ADJUSTMENTS

This Contract contains price adjustments for hot mix asphalt and Portland cement mixtures, diesel fuel, and gasoline. For reference the base prices are as follows: liquid asphalt $635.00 per ton, Portland cement $425.13 per ton, diesel fuel $2.766 per gallon, and gasoline $2.453 per gallon, and Steel Base Price Index 342.1. MassDOT posts the **Price Adjustments** on their Highway Division's website at
https://www.mass.gov/massdot-contract-price-adjustments

This Contract contains Price Adjustments for steel. See Document 00813 - PRICE ADJUSTMENT FOR STRUCTURAL STEEL AND REINFORCING STEEL for their application and base prices.

MassDOT projects are subject to the rules and regulations of the Architectural Access Board (521 CMR 1.00 et seq.)

Prospective bidders and interested parties can access this information and more via the internet at WWW.COMMBUYS.COM.

BY: Monica G. Tibbits-Nutt, Secretary and CEO, MassDOT
Jonathan L. Gulliver, Administrator, MassDOT Highway Division
SATURDAY, JULY 19, 2025

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DOCUMENT 00210

REQUIREMENTS OF MASSACHUSETTS GENERAL LAWS
CHAPTER 30, SECTION 39R;
CHAPTER 30, SECTION 39O

July 1, 1981, updated October 2016

M.G.L. c. 30, § 39R. Award of Contracts; Accounting Statements; Annual Financial Statements; Definitions.

(a) The words defined herein shall have the meaning stated below whenever they appear in this section:

(1) “Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.

(2) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.

(3) “Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(4) “Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

(5) “Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(6) "Accountant's Report", when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(7) “Management", when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) Until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and

(3) If the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and

(4) If the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) If the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization;

(2) transactions are recorded as necessary

i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. to maintain accountability for assets;

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to:

(1) whether the representations of management in response to this paragraph and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner of capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b).

M.G.L. c. 30, § 39O: Suspension, Delay, or Interruption or Failure to Act by Awarding Authority; Adjustment in Contract Price; Submission of Claims.

Section 39O. Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

<<<<<<<<<<>>>>>>>>>>

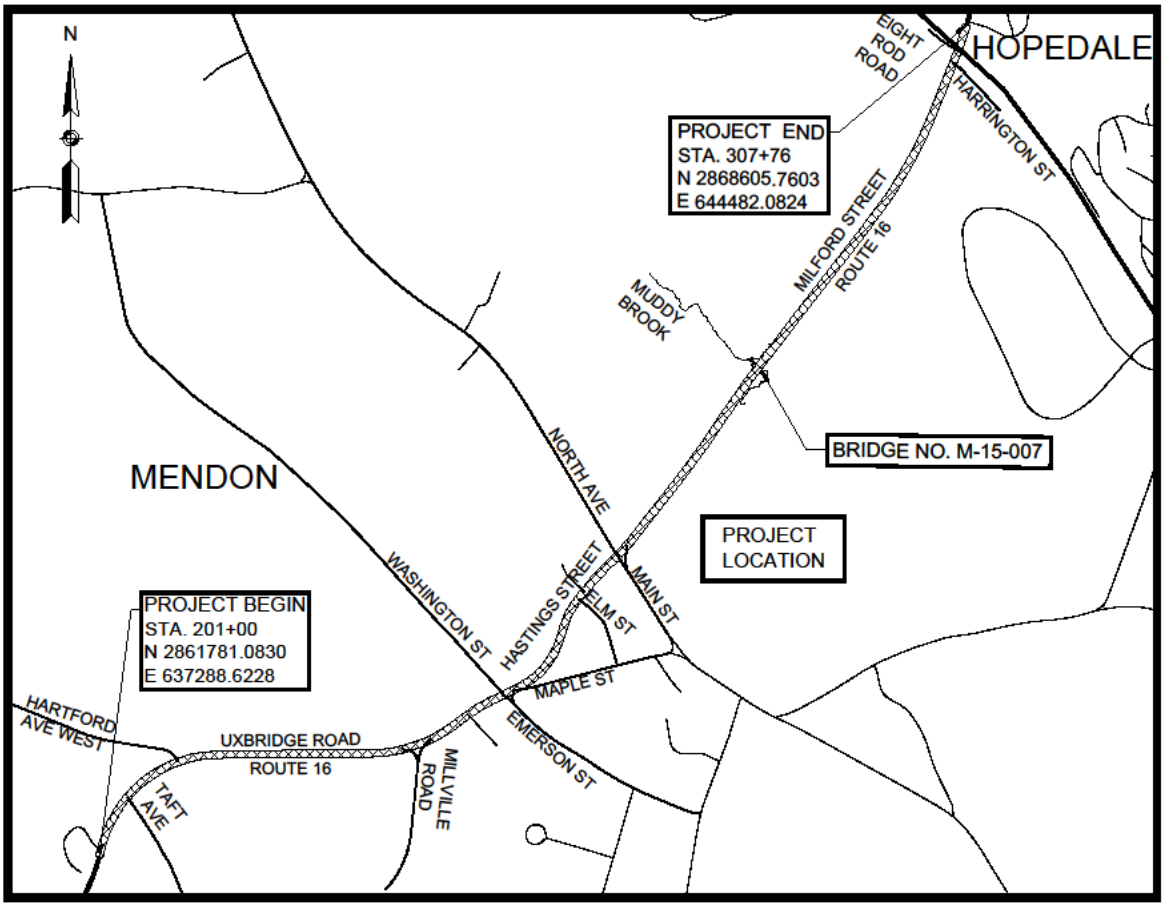
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DOCUMENT 00331

LOCUS MAP

MENDON
Federal Aid Project No. NHP(NHS)-003S(866)X
Resurfacing and Related Work on Route 16



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DOCUMENT 00439

Final Report ☐

Interim Report ☐

CONTRACTOR PROJECT EVALUATION FORM

For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010

Date: _____

City/Town: _____ Contractor: _____

Project: _____ Address: _____

F.A. No. _____ Contract Number: _____

Bid Price: _____ Notice to Proceed: _____

Funds: State: _____ Fed Aid: _____ Current Contract Completion Date: _____

Date Work Started: _____ Date Work Completed*: _____

Contractor's Superintendent: _____

Division: (indicates class of work) Highway: _____ Bridge: _____ Maintenance: _____

*If work was NOT completed within specified time (including extensions) give reasons on following page.

	Excellent 10	Very Good 9	Average 8	7	Fair 6	5	Poor 4	% Rating
1. Workmanship								x 2=
2. Safety								x 2=
3. Schedule								x 1.5=
4. Home Office Support								x 1=
5. Subcontractors Performance								x 1=
6. Field Supervision/ Superintendent								x 1=
7. Contract Compliance								x 0.5=
8. Equipment								x 0.5=
9. Payment of Accounts								x 0.5=
(use back for additional comments)						**Overall Rating:**		

(Give explanation of items 1 through 9 on the following page in numerical order if overall rating is below 80%. Use additional sheets if necessary.)

_____ _____

District Construction Engineer's Signature/Date Resident Engineer's Signature/Date

_____

Contractor's Signature Acknowledging Report/Date

Contractor Requests Meeting with the District: No ☐ Yes ☐ Date Meeting Held: _____

Contractor's Comments/Meeting Notes (extra sheets may be added to this form and noted here if needed): _____

_____

_____

CONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number:_____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

A deduction shall be recommended for unsatisfactory performance if computed overall rating is under 80%.
A deduction may be recommended for this project being completed late due to the Contractor's fault.

RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR
(*Write Yes or No in space provided*)

I recommend a deduction for Contractor's unsatisfactory performance: _____

I recommend a deduction for project completed late:_____

Signed: _____
District Highway Director

EXPLANATION OF RATINGS 1 – 9:_____

WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00440

Final Report ☐

Interim Report ☐

SUBCONTRACTOR PROJECT EVALUATION FORM

For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010

Date: _____

City/Town: _____ Subcontractor: _____

Project: _____ Address: _____

F.A. No.: _____ Contract Number: _____

Prime Contractor _____ Current Contract Completion Date: _____

Date Work Started: _____ Date Work Completed*: _____

Subcontractor's Superintendent: _____

Type of Work Performed by Subcontractor: _____

*If work was NOT completed within specified time (including extensions) give reasons on following page.

	Excellent 10	Very Good 9	Average 8	7	Fair 6	5	Poor 4	% Rating
1. Workmanship								x 2=
2. Safety								x 2=
3. Schedule								x 1.5=
4. Home Office Support								x 1.5=
5. Field Supervision/ Superintendent								x 1=
6. Contract Compliance								x 1=
7. Equipment								x 0.5=
8. Payment of Accounts								x 0.5=
(use back for additional comments)							**Overall Rating:**	

(Give explanation of items 1 through 8 on the following page in numerical order if overall rating is below 80%. Use additional sheets if necessary.)

_____ _____

District Construction Engineer's Signature/Date Resident Engineer's Signature/Date

_____ _____

Contractor Signature Acknowledging Report/Date Subcontractor Signature Acknowledging Report/Date

Subcontractor Requests Meeting with the District: No ☐ Yes ☐ Date Meeting Held: _____

Subcontractor's Comments / Meeting Notes (extra sheets may be added to this form and noted here if needed):

_____

_____

Contractor's Comments: _____

_____

SUBCONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number:_____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

A deduction shall be recommended for unsatisfactory performance if computed overall rating is under 80%.
A deduction may be recommended for this project being completed late due to the Contractor's fault.

RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR
(*Write Yes or No in space provided*)

I recommend a deduction for Contractor's unsatisfactory performance: _____

I recommend a deduction for project completed late:_____

Signed: _____
District Highway Director

EXPLANATION OF RATINGS 1 – 8: _____

WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS
Revised: 04-16-25

NOTICE OF AVAILABILITY

The STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES dated 2025, the SUPPLEMENTAL SPECIFICATIONS, the 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS; the 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING and the CONSTRUCTION STANDARD DETAILS are available online at https://www.mass.gov/massdot-highway-division-manuals-and-publications

SPECIAL PROVISIONS FOR RIGHT-TO-KNOW ACT REQUIREMENTS

The Contractor's attention is directed to Massachusetts General Laws, Chapter 111F, commonly known as the Right-To-Know Act, and to the regulations promulgated pursuant thereto. Among the provisions of the Right-To-Know Act is a requirement that employers make available to employees Materials Safety Data Sheets (MSDS) for any substance on the Massachusetts Substance List (MSL) to which employees are, have been, or may be exposed.

To ensure prompt compliance with these regulations and legislation, the Contractor shall:

1. Deliver to the Department, prior to the start of any work under this contract, copies of MSDS for all MSL substances to be used, stored, processed or manufactured at the worksite by the Contractor.

2. Train employees of the Department, who may be exposed to MSL substances as a result of the Contractor's work under this contract, with regard to those specific substances in accordance with requirements of the Right-To-Know Act.

3. Observe all safety precautions recommended on the MSDS for any MSL substance to be used, stored, processed, or manufactured at the worksite by the Contractor.

4. Inform the Department in writing regarding specific protective equipment recommended in the MSDS for MSL substances to which employees of the Department may be exposed as a result of the Contractor's work under this contract.

The Department shall not be liable for any delay or suspension of work caused by the refusal of its employees to perform any work due to the Contractor's failure to comply with the Right-To-Know Act. The Contractor agrees to hold the Department or the Commissioner of the Department harmless and fully indemnified for any and all claims, demands, fines, actions, complaints, and causes of action resulting from or arising out of the Contractor's failure to comply with the requirements of the Right-To-Know Act.

ALTERNATIVE DISPUTE RESOLUTION
Forum, Choice of Law and Mediations:

Any actions arising out of a contract shall be governed by the laws of Massachusetts and shall be brought and maintained in a State or federal court in Massachusetts which shall have exclusive jurisdiction thereof. MassDOT and the Contractor may both agree to mediation of any claim and will share the costs of such mediation pro rata based on the number of parties involved.

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DOCUMENT 00715

SUPPLEMENTAL SPECIFICATIONS

MARCH 31, 2025

The 2025 *Standard Specifications for Highways and Bridges* are amended by the following modifications, additions and deletions. These Supplemental Specifications prevail over those published in the Standard Specifications.

The Specifications Committee has issued these Supplemental Specifications for inclusion into each proposal until such time as they are updated or incorporated into the next Standard Specifications.

Contractors are cautioned that these Supplemental Specifications are dated and will change as they are updated.

DIVISION I

GENERAL REQUIREMENTS AND COVENANTS

SECTION 2.00: PROPOSAL REQUIREMENTS AND CONDITIONS

Subsection 2.09: Rejection of Proposals
Replace bullet (i) in the third paragraph with the following:

(i.) award of the contract would result in the Bidder exceeding the Aggregate Bonding Capacity or the Single Bonding Capacity established by its Surety Company, or the Bidder's Proposal exceeds its Single Contract Limit, or the Bidder was not prequalified in the specified class of work on or before the time of bid opening; or

SECTION 7.00: LEGAL RELATIONS AND RESPONSIBILITY TO PPUBLIC

Subsection 7.05: Insurance Requirements
Change the title of paragraph A to Workers' Compensation Insurance

Subsection 7.22: Labor, Lodging, Board, Maximum Hours of Employment, Weekly Payment, Keeping of Payroll Records.
In the second paragraph replace the word "workman" to "worker" and the word "workmen" to "workers".

Replace the third paragraph with the following:

Attention of Bidders is called to MGL Chapter 149, Section 148 requiring the weekly payment of employee wages.

SECTION 9.00: MEASUREMENT AND PAYMENT

Subsection 9.03: Payment for Extra Work
Replace paragraph B., first paragraph, numbers (2) and (3) with the following.

(2) Plus 13 percent of direct labor, for the estimated costs of Federal Insurance Contribution Act (FICA) including Medicare; Federal Unemployment Tax Act (FUTA); State Unemployment Tax Act (SUTA), which includes Unemployment Insurance, the Workforce Training Fund Program,-Employer Medical Assistance Contribution, and COVID-19 Recovery Assessment; Earned Sick Time (EST) Law (940 CMR 33.00); and Paid Family and Medical Leave (PFML) Act (458 CMR 2.00);

or, as an alternative to the above 13 percent, the Contractor may elect to use actual rates for FICA, FUTA, SUTA, EST and PFML provided the actual rates are supported with verifiable documentation and shall be subject to review by MassDOT Audit Operations.

(3) Plus the estimated cost of Workers' Compensation and Liability Insurance, Health, Welfare and Pension benefits, and such additional fringe benefits which the Contractor is required to pay as a result of Union Labor Agreements and/or is required by authorized governmental agencies;

In paragraph B., second paragraph, number (3), replace the word "Workmen's" with "Workers'" .

DIVISION III

MATERIALS SPECIFICATIONS

SECTION M2: AGGREGATES AND RELATED MATERIALS

Subsection M2.01.0 Crushed Stone
Replace the fourth paragraph and the associated asterisk notes with the following;

The crushed stone shall have a maximum 45% wear as determined by the Los Angeles Abrasion Test (AASHTO T 96)

SECTION M7: PAINTS, PROTECTIVE COATINGS AND PAVEMENT MARKINGS

Subsection M7.01.04 Fast Drying White and Yellow Waterborne Traffic Paint
Replace the subsection with the following;

Approved waterborne traffic paint shall be tested in accordance with AASHTO M 348, Code of Federal Regulations: 40 CFR 261.24, for heavy metal content and be listed on the QCML. The markings shall be installed using reflective glass beads meeting the requirements of M7.01.07. For waterborne yellow paint use Organic Yellow No. 65 or No. 75 pigment.

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END OF SUPPLEMENTAL SPECIFICATIONS

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DOCUMENT 00719

(Revised September 14, 2023 – for all Federally Aided Projects)

SPECIAL PROVISIONS FOR PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES

(IMPLEMENTING TITLE 49 OF THE CODE OF FEDERAL REGULATIONS, PART 26)

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POLICY

The Massachusetts Department of Transportation (MassDOT) receives Federal financial assistance from the Federal Highway Administration (FHWA), United States Department of Transportation (U.S. DOT), and as a condition of receiving this assistance, has signed an assurance that it will comply with 49 CFR Part 26 (Participation By Disadvantaged Business Enterprises In Department Of Transportation Financial Assistance Programs). The U.S. DOT Disadvantaged Business Enterprise Program is authorized by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users ("SAFETEA-LU"), as amended, at Title 23, United States Code, § 1101.

Accordingly, MassDOT has established a Disadvantaged Business Enterprise (DBE) Program in accordance with 49 CFR Part 26. It is the policy of MassDOT to ensure that DBEs have an equal opportunity to receive and participate in U.S. DOT assisted Contracts, without regard to race, color, national origin, or sex. To this end, MassDOT shall not directly, or through contractual or other arrangements, use criteria or methods of administration that have the effect of defeating or substantially impairing accomplishment of the program objectives stated below:

- To ensure nondiscrimination in the award and administration of U.S. DOT assisted Contracts;
- To create a level playing field on which DBEs can compete fairly for U.S. DOT assisted Contracts;
- To ensure that the DBE Program is narrowly tailored in accordance with applicable law;
- To ensure that only firms that fully meet 49 CFR Part 26 eligibility standards are permitted to participate as DBEs;
- To help remove barriers to the participation of DBEs in U.S. DOT assisted Contracts; and
- To assist the development of firms that can compete successfully in the market place outside the DBE Program.

The Director of Civil Rights of MassDOT has been designated as the DBE Liaison Officer. The DBE Liaison Officer is responsible for implementing all aspects of the DBE Program. Other MassDOT employees are responsible for assisting the Office of Civil Rights in carrying out this obligation. Implementation of the DBE Program is accorded the same priority as compliance with all other legal obligations incurred by MassDOT in its financial assistance agreements with each operating administration of the U.S. DOT. Information on the Federal requirements and MassDOT's policies and information can be found at:

Type of Info	***Website***	***Description***
MassDOT Highway Division Policies and Info	https://www.mass.gov/disadvantaged-business-enterprise-goals-2019-2022	*MassDOT–Highway Div'n Page*
For copies of the Code of Federal Regulations	http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR	FDsys – US Gov't Printing Office
For information about the U.S.DOT DBE Program	https://www.transportation.gov/civil-rights/disadvantaged-business-enterprise	U.S. DOT/ FHWA page

1. DEFINITIONS

As used in these provisions, the terms set out below are defined as follows:

"Broker", for purposes of these provisions, shall mean a DBE Entity that has entered into a legally binding relationship to provide goods or services delivered or performed by a third party. A broker may be a DBE Entity that arranges or expedites transactions but performs no work or installation services.

"Contractor", "General" or "Prime" Contractor, "Bidder," and "DB Entity" shall mean a person, firm, or other entity that has contracted directly with MassDOT to provide contracted work or services.

"Contract" shall mean the Contract for work between the Contractor and MassDOT.

"DBB" or "Design-Bid-Build" shall mean the traditional design, bid and project delivery method consisting of separate contracts between awarding authority and a designer resulting in a fully designed project; and a separate bidding process and Contract with a construction Contractor or Bidder.

"DB" or "Design-Build" shall mean an accelerated design, bid and project delivery method consisting of a single contract between the awarding authority and a DB Entity, consisting of design and construction companies that will bring a project to full design and construction.

"Disadvantaged Business Enterprise" or "DBE" shall mean a for-profit, small business concern:

(a) that is at least fifty-one (51%) percent owned by one or more individuals who are both socially and economically disadvantaged, or, in the case of any corporation, in which at least fifty-one (51%) percent of the stock is owned by one or more such individuals; and

(b) where the management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.

"FHWA" shall mean the Federal Highway Administration," an agency within U.S. DOT that supports State and local governments in the design, and maintenance of the Nation's highway system (Federal Aid Highway Program).

"Good faith efforts" shall mean efforts to achieve a DBE participation goal or other requirement of these Special Provisions that, by their scope, intensity, and appropriateness to the objective, can reasonably be expected to fulfill the program requirement. Such efforts must be deemed acceptable by MassDOT.

"Joint Venture" shall mean an association of a DBE firm and one or more other firms to carry out a single, for-profit business enterprise, for which the parties combine their property, capital, efforts, skills and knowledge, and in which the DBE is responsible for a distinct, clearly defined portion of the work of the Contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

"Approved Joint Venture" shall mean a joint venture, as defined above, which has been approved by MassDOT's Prequalification Office and Office of Civil Rights for DBE participation on a particular Contract.

"Manufacturer" shall mean a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles or equipment required under the contract and of the general character described by the specifications.

"Regular Dealer" shall mean a DBE firm that owns, operates, or maintains a store, warehouse, or other establishment in which materials, supplies, articles or equipment of the general character described by the specifications and required under the Contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.

(a) To be a regular dealer, the firm must be an established, regular business that engages, as its principal business, and under its own name, in the purchase and sale of the products in question.

(b) A person may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business as provided above if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by long term lease agreement and not on an ad hoc or contract by contract basis.

(c) Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not regular dealers within the meaning of this definition.

"Responsive" and "Responsible" refers to the bidder's submittal meeting all of the requirements of the advertised request for proposal. The term responsible refers to the ability of the Contractor to perform the work. This ability can be determined prior to bid invitations.

"Small Business or Small Business Concern" shall mean a small business concern or company as defined in Section 3 of the Small Business Act and SBA regulations implementing it (13 CFR Part 121); and is a business that does not exceed the cap on annual average gross receipts established by the U.S. Secretary of Transportation pursuant to 49 CFR Part 26.65; see also 49 CFR Part 26.39.

"SDO" shall mean the Massachusetts Supplier Diversity Office, formerly known as the State Office of Minority and Women Business Assistance (SOMWBA). In 2010, SOMWBA was abolished and the SDO was established. *See* St. 2010, c. 56. The SDO has assumed all the functions of SOWMBA. SDO is an agency within the Commonwealth of Massachusetts Executive office of Administration and Finance (ANF) Operational Services Division (OSD). The SDO mandate is to help promote the development of business enterprises and non-profit organizations owned and operated by minorities and women.

"Socially and economically disadvantaged individuals" shall mean individuals who are citizens of the United States (or lawfully admitted permanent residents) and who are:

(a) Individuals found by SDO to be socially and economically disadvantaged individuals on a case by case basis.

(b) Individuals in the following groups, members of which are rebuttably presumed to be socially and economically disadvantaged:

(1) "Black Americans" which includes persons having origin in any of the Black racial groups of Africa; (2) "Hispanic Americans" which include persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race; (3) "Native Americans" which include persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians; (4) "Asian Pacific Americans" which includes persons whose origins are from Japan, China, Taiwan, Korea, Burma (Myanmar), Vietnam, Laos, Cambodia (Kampuchea), Thailand, Malaysia, Indonesia, the Philippines, Brunei, Samoa, Guam, the U.S. Trust Territories of the Pacific Islands (Republic of Palau), the Commonwealth of the Northern Marianas Islands, Macao, Fiji, Tonga, Kiribati, Tuvalu, Nauru, Federated States of Micronesia, or Hong Kong; (5) "Subcontinent Asian Americans" which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka; (6) Women; or (7) Any additional groups whose members are designated as socially and economically disadvantaged by the Small Business Administration (SBA), at such time as the SBA designation becomes effective.

Other terms and definitions applicable to the U.S. DOT DBE Program may be found at 49 CFR Part 26 and related appendices and guidance pages.

2. DBE PARTICIPATION

a. Goal

On this Contract, MassDOT has established the following goal(s) for participation by firms owned and controlled by socially and economically disadvantaged persons. At least half of the goal must be met in the form of DBE Subcontractor construction activity as opposed to material supplies or other services. The applicable goal remains in effect throughout the life of the contract regardless of whether pre-identified DBE Subcontractors remain on the Project or under Contract.

☒ Design-Bid-Build Projects: DBE Participation Goal **15 %**
(*One half of this goal shall be met in the form of Subcontractor construction activity*)

☐ Design-Build Projects: DBE Design Participation Goal ____**%** and DBE Construction Participation Goal **%**
(One half of the Construction Goal shall be met in the form of Subcontractor construction activity)

b. Bidders List

Pursuant to the provisions of 49 CFR Part 26.11(c), Recipients such as MassDOT, must collect from all Bidders who seek work on Federally assisted Contracts the firm full company name(s), addresses and telephone numbers of all firms that have submitted bids or quotes to the Bidders in connection with this Project. All bidders should refer to the Special Provision Document "A00801" of the Project proposal for this requirement.

In addition, MassDOT must provide to U.S. DOT, information concerning contractors firm status as a DBE or non-DBE, the age of the firm, and the annual gross receipts of the firm within a series of brackets (e.g., less than $500,000; $500,000–$1 million; $1–2 million; $2–5 million, etc.). The status, firm age, and annual gross receipt information will be sought by MassDOT regularly prior to setting its DBE participation goal for submission to U.S. DOT. MassDOT will survey each individual firm for this information directly.

Failure to comply with a written request for this information within fifteen (15) business days may result in the suspension of bidding privileges or other such sanctions, as provided for in Section 9 of this provision, until the information is received.

3. CONTRACTOR ASSURANCES

No Contractor or any Subcontractor shall discriminate on the basis of race color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in all respects and as applicable prior to, or subsequent to, award of U.S. DOT assisted Contracts. The Contractor agrees to affirmatively seek out and consider DBE firms as Contractors, Subcontractors, and/or suppliers of materials and services for this Contract. No Contract will be approved until MassDOT has reviewed Bidders'/Contractors' affirmative actions concerning DBEs. Failure to carry out these requirements is a material breach of this Contract which may result in the termination of the Contract or such other remedy as MassDOT or FHWA deem appropriate.

4. REQUIRED SUBCONTRACT PROVISIONS

The Prime Contractor shall include the provisions of Section 3 above in every subcontract, making those provisions binding on each Subcontractor; in addition, the Prime Contractor shall include a copy of this Special Provision, in its entirety, in every subcontract with a DBE firm which is, or may be, submitted for credit toward the Contract participation goal.

5. ELIGIBILITY OF DBES

Only firms that have been certified by SDO and confirmed by MassDOT as eligible in accordance with 49 CFR Part 26 to participate as DBEs on federally aided MassDOT Contracts may be used on this Contract for credit toward the DBE participation goal.

a. Massachusetts DBE Directory

MassDOT makes available to all bidders the most current Massachusetts Disadvantaged Business Enterprise Directory. This directory is made available for Contractors' convenience and is informational only. The Directory lists those firms that have been certified as eligible in accordance with the criteria of 49 CFR Part 26 to participate as DBEs on federally aided MassDOT contracts. The Directory also lists the kinds of work each firm is certified to perform but does not constitute an endorsement of the quality of performance of any business and does not represent MassDOT Subcontractor approval.

Contractors are encouraged to make use of the DBE Directory maintained by SDO on the Internet. This listing is updated daily and may be accessed at the SDO's website at:
https://www.diversitycertification.mass.gov/BusinessDirectory/BusinessDirectorySearch.aspx

b. DBE Certification

A firm must apply to SDO, currently acting as certification agent for MassDOT, for DBE certification to participate on federally aided MassDOT Contracts. A DBE application may be made in conjunction with a firm's application to SDO for certification to participate in state-funded minority and women business enterprise programs or may be for DBE certification only. An applicant for DBE certification must identify the area(s) of work it seeks to perform on U.S. DOT funded projects.

c. Joint Venture Approval

To obtain recognition as an approved DBE Joint Venture, the parties to the joint venture must provide to MassDOT's Office of Civil Rights and Prequalification Office, at least fourteen (14) business days before the bid opening date, an Affidavit of DBE/Non-DBE Joint Venture in the form attached hereto, and including, but not limited to the following:

1. a copy of the Joint Venture Agreement;
2. a description of the distinct, clearly defined portion of the contract work that the DBE will perform with its own forces; and,
3. all such additional information as may be requested by MassDOT for the purpose of determining whether the joint venture is eligible.

6. COUNTING DBE PARTICIPATION TOWARDS DBE PARTICIPATION GOALS

In order for DBE participation to count toward the Contract participation goal, the DBE(s) must have served a commercially useful function in the performance of the Contract and must have been paid in full for acceptable performance.

a. Commercially Useful Function

(1) In general, a DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. With respect to materials and supplies used on the Contract, the DBE must be responsible for negotiating price, determining quality and quantity, ordering the material, installing (where applicable) and paying for the material itself.

(2) To determine whether a DBE is performing a commercially useful function, MassDOT will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the Contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work, and other relevant factors.

(3) A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation. In determining whether a DBE is such an extra participant, MassDOT will examine similar transactions, particularly those in which DBEs do not participate.

b. Counting Participation Toward The Contract Participation Goal

DBE participation which serves a commercially useful function shall be counted toward the DBE participation goal in accordance with the Provisions of 49 CFR Part 26.55(a) to (h), as follows:

(1) When a DBE participates in a construction Contract, MassDOT will count the value of the work performed by the DBE's own forces. MassDOT will count the cost of supplies and materials obtained by the DBE for the work of its contract, including supplies purchased or equipment leased by the DBE. Supplies, labor, or equipment the DBE Subcontractor uses, purchases, or leases from the Prime Contractor or any affiliate of the Prime Contractor will not be counted.

(2) MassDOT will count the entire amount of fees or commissions charged by a DBE firm for providing bona fide services, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a U.S. DOT assisted Contract, toward DBE participation goals, provided it is determined that the fee is reasonable and not excessive as compared with fees customarily allowed for similar services.

(3) When a DBE performs as a participant in a joint venture, MassDOT will count toward DBE participation goals a portion of the total dollar value of the contract that is equal to the distinct, clearly defined portion of the work of the Contract that the DBE performs with its own forces.

(4) MassDOT will use the following factors in determining whether a DBE trucking company is performing a commercially useful function:

(i) the DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract; there cannot be a contrived arrangement for the purpose of meeting DBE participation goals.

(ii) the DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the Contract.

(iii) the Contractor will receive DBE credit for the total value of the transportation services the DBE provides on the Contract using trucks owned, insured, and operated by the DBE itself and using drivers the DBE employs alone.

(iv) the DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The Contractor who has a contract with a DBE who leases trucks from another DBE will receive credit for the total value of the transportation services of the lease.

(v) the DBE may also lease trucks from a non-DBE firm, including an owner-operator. The Contractor who has a Contract with a DBE who leases trucks from a non-DBE is entitled to credit for the total value of the transportation services provided by non-DBE lessees not to the exceed the value of transportation services provided by DBE-owned trucks on the Contract. Additional participation by non-DBE lessees receives credit only for the fee or commission it receives as a result of the lease arrangement, fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.

(vi) the lease must indicate that the DBE has exclusive use of, and control over, the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

(5) MassDOT will count the Prime Contractor's expenditures with DBEs for materials or supplies toward DBE participation goals as follows:

(i) if the materials or supplies are obtained from a DBE manufacturer, as defined in Section 1 above, MassDOT will count one hundred (100%) percent of the cost of the materials or supplies toward DBE participation goals, provided the DBE meets the other requirements of the regulations.

(ii) if the materials or supplies are purchased from a DBE regular dealer, as defined in Section 1 above, MassDOT will count sixty (60%) percent of the cost of the materials or supplies toward the Contract participation goal, provided the DBE meets the other requirements of the regulations.

(iii) for materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer, MassDOT will count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site toward the Contract participation goal, provided that MassDOT determines the fees to be reasonable and not excessive as compared with fees customarily allowed for similar services; the cost of the materials and supplies themselves will not be counted; and provided the DBE meets the other requirements of the regulations.

c. Joint Check Policy

MassDOT recognizes that the use of joint checks may be a business practice required by material suppliers and vendors in the construction industry. A joint check is a two-party check issued by a/the Prime Contractor to a DBE third party such as a regular dealer of material or supplies. The Prime Contractor issues the check as payor to the DBE and the third party jointly as payees to guarantee payment to the third party for materials or supplies obtained or to be used by the DBE. FHWA has established criteria to ensure that DBEs are in fact performing a commercially useful function ("CUF") while using a joint check arrangement. Contractors and DBEs must meet and conform to these conditions and criteria governing the use of joint checks.

In the event that a Contractor or DBE Subcontractor desires to a use joint check, MassDOT will require prior notice and will closely monitor the arrangement for compliance with FHWA regulations and guidance. MassDOT may allow a joint check arrangement and give credit to a Contractor for use of the DBE where one or more of the following conditions exist:

- The use of a joint check is in fact required by this type of vendor or supplier as a standard industry practice that applies to all Contractors (DBEs and non-DBEs); or is required by a specific vendor or supplier;
- Payment for supplies or materials would be delayed for an unreasonably extended period without the joint check arrangement;
- The DBE (or any of its Subcontractors) has a pattern or history of not paying a vendor or supplier within a reasonable time or has not established enough of a credit history with the supplier or vendor; and/or
- The presence of severe adverse economic conditions, where credit resources may be limited and such practices may be necessary or required to effect timely payments.

Other factors MassDOT may consider:

- Whether there is a requirement by the Prime Contractor that a DBE should use a specific vendor or supplier to meet their Subcontractor specifications;
- Whether there is a requirement that a DBE use the Prime Contractor's negotiated price;
- The independence of the DBE;
- Whether approval has been sought prior to use of a joint check arrangement; and
- Whether any approved joint check arrangement has exceeded a reasonable period of use;
- The operation of the joint check arrangement; and
- Whether the DBE has made an effort to establish alternate arrangements for following periods (i.e., the DBE must show it can, or has, or why it has not, established or increased a credit line with the vendor or supplier).

Even with the use of a Joint Check, both the Contractor and DBE remain responsible for compliance with all other elements under 49 CFR § 26.55 (c) (1), and must still be able to prove that a commercially useful function is being performed for the Contractor.

d. Joint Check Procedure(s)

- The DBE advises its General or Prime Contractor that it will have to use a Joint Check and provide proof of such requirement.
- The General or the Prime Contractor submits a request for approval to MassDOT, using MassDOT's approved Joint Check Request form (Document B00855) and by notification on the DBE Letter of Intent (Document B00854), and any other relevant documents. Requests that are not initiated during the bid process should be made in writing and comply with the procedure.
- The MassDOT Office of Civil Rights will review the request and render a decision as part of the approval process for DBE Schedules and Letters of Intent.
- Review and Approval will be project specific and relevant documents will be made part of the project Contract file.
- Payments should be made in the name of both the DBE and vendor or supplier. Payments should be issued and signed by the Contractor as only the guarantor for prompt payment of purchases to the vendor or supplier. The payment to the vendor or supplier should be handled by the DBE (i.e. if possible, funds or the joint check should be processed by the DBE and sent by the DBE to the vendor or supplier).
- MassDOT may request copies of cancelled checks (front and back) and transmittal information to verify any payments made to the DBE and vendor or supplier.
- MassDOT may request other information and documents, and may ask questions of the Contractor, Subcontractor and vendor or supplier prior to, during, and after the project performance to ascertain whether the Subcontractor is performing a commercially useful function and all parties are complying with DBE Program policies and procedures as part of the Subcontractor approval process.

7. AWARD DOCUMENTATION AND PROCEDURES

a. The two lowest bidders/the two bidders with the lowest price per quality score point, shall submit, by the close of business on the third (3rd) business day after the bid opening, a completed Schedule of Participation by DBEs (Document B00853) which shall list:

(1) The full company name, address and telephone number of each DBE with whom the bidder intends to make a commitment.

(2) The contract item(s), by number(s) and quantity(ies), if applicable, or specific description of other business activity to be performed by each DBE as set forth in the Letters of Intent. The Bidder shall list only firms which have the capacity to perform, manage and supervise the work proposed in accordance with the requirements of 49 CFR Part 26 and Section **6.b** of these Special Provisions.

(3) The total dollar amount to be paid to each DBE. (Bidders are cautioned that at least one half of the participation goal must be met with construction activity work.)

(4) The total dollar amount to be paid to each DBE that is eligible for credit toward the DBE participation goal under the counting rules set out in Section **6.b**.

(5) The total creditable DBE participation as a percentage of the total bid price.

b. All firms listed on the Schedule must be currently certified.

c. The two lowest bidders/the two bidders with the lowest price per quality score point, shall each submit, with their Schedules of Participation, fully completed, signed Letters of Intent (Document B00854) from each of the DBEs listed on the Schedule. The Letters of Intent shall be in the form attached and shall identify specifically the contract activity the DBE proposes to perform, expressed as contract item number, if applicable, description of the activity, NAICS code, quantity, unit price and total price. In the event of discrepancy between the Schedule and the Letter of Intent, the Letter of Intent shall govern.

d. Evidence of good faith efforts will be evaluated by MassDOT in the selection of the lowest responsible bidder.

All information requested by MassDOT for the purpose of evaluating the Contractor's efforts to achieve the participation goal must be provided within three (3) calendar days and must be accurate and complete in every detail. The apparent low bidder's attainment of the DBE participation goal or a satisfactory demonstration of good faith efforts is a prerequisite for award of the Contract.

e. Failure to meet, or to demonstrate good faith efforts to meet, the requirements of these Special Provisions shall render a bid non-responsive. Therefore, in order to be eligible for award, the bidder (1) must list all DBE's it plans to employ on the Schedule of Participation; and provide the required Letters of Intent for, DBE participation which meets or exceeds the Contract goal in accordance with the terms of these Special Provisions or (2) must demonstrate, to the satisfaction of MassDOT, that good faith efforts were made to achieve the participation goal. MassDOT will adhere to the guidance provided in Appendix A to 49 CFR Part 26 on the determination of a Contractor's good faith efforts to meet the DBE participation goal(s) set forth in Section 2 herein.

f. If MassDOT finds that the percentage of DBE participation submitted by the bidder on its Schedule does not meet the Contract participation goal, or that Schedule and Letters of Intent were not timely filed, and that the bidder has not demonstrated good faith efforts to comply with these requirements, it shall propose that the bidder be declared ineligible for award. In that case, the bidder may request administrative reconsideration. Such requests must be sent in writing within three (3) calendar days of receiving notice of proposed ineligibility to: The Office of the General Counsel, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA, 02116.

g. If, after administrative reconsideration, MassDOT finds that the bidder has not shown that sufficient good faith efforts were made to comply with the requirements of these Special Provisions, it shall reject the bidder's proposal and may retain the proposal guaranty.

h. Actions which constitute evidence of good faith efforts to meet a DBE participation goal include, but are not limited to, the following examples, which are set forth in 49 CFR Part 26, Appendix A:

(1) Soliciting through all reasonable and available means (e.g., attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBEs who have the capability to perform the work of the Contract. The bidder must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.

(2) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE participation goal will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the Prime Contractor might otherwise prefer to perform these work items with its own forces.

(3) Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

(4) Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE Subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE Subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone number of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.

A bidder using good business judgment would consider a number of factors in negotiating with Subcontractors, including DBE Subcontractors, and would take a firm's price and capabilities as well as Contract participation goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the Contract DBE participation goal, as long as such costs are reasonable. Also, the ability or desire of a Prime Contractor to perform the work of a Contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime Contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.

(5) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. Contractors should be careful of adding additional requirements of performance that would in effect limit participation by DBEs or any small business. The Contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. nonunion employee status) are not legitimate causes for the rejection or non-solicitation of bids in the Contractor's efforts to meet the Contract participation goal.

(6) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.

(7) Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

(8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case by case basis to provide assistance in the recruitment and placement of DBEs.

8. COMPLIANCE

a. All activity performed by a DBE for credit toward the Contract participation goal must be performed, managed and supervised by the DBE in accordance with all commercially useful function requirements of 49 CFR Part 26. The Prime Contractor shall not enter into, or condone, any other arrangement.

b. The Prime Contractor shall not perform with its own organization, or assign to any other business, an activity designated for the DBE(s) named on the Schedule(s) submitted by the Prime Contractor under Section 7 or under paragraph **8.f** of this section, without the approval of MassDOT in accordance with the requirements of paragraphs **8.f** and **8.j** of this section.

c. MassDOT may suspend payment for any activity that was not performed by the DBE to whom the activity was committed on the approved Schedule of Participation, or that was not performed in accordance with the requirements of Section 6.

d. MassDOT retains the right to approve or disapprove of any or all Subcontractors. Requests by the Prime Contractor for approval of participation by a DBE Subcontractor for credit toward the Contract participation goal must include, in addition to any other requirements for Subcontractor approval, the following:

(1) A copy of the proposed subcontract. The subcontract must be for at least the dollar amount, and for the work described, in the Bidder's Schedule of Participation.

(2) A resume stating the qualifications and experience of the DBE Superintendent and/or foreperson who will supervise the on-site work. A new resume will be required for any change in supervisory personnel during the progress of the work.

(3) A Schedule of Operations indicating when the DBE is expected to perform the work.

(4) A list of (1) equipment owned by the DBE to be used on the Project, and (2) equipment to be leased by the DBE for use on the Project.

(5) A list of: (1) all projects (public and private) which the DBE is currently performing; (2) all projects (public and private) to which the DBE is committed; and (3) all projects (public and private) to which the DBE intends to make a commitment. For each Contract, list the contracting organization, the name and telephone number of a contact person for the contracting organization, the dollar value of the work, a description of the work, and the DBE's work schedule for each project.

e. If, pursuant to the Subcontractor approval process, MassDOT finds that a DBE Subcontractor does not have sufficient experience or resources to perform, manage and supervise work of the kind proposed in accordance with the requirements of 49 CFR Part 26, approval of the DBE Subcontractor may be denied. In the event of such denial, the Prime Contractor shall proceed in accordance with the requirements paragraphs **8.f** and **8.j** of this section.

f. If, for reasons beyond its control, the Prime Contractor cannot comply with its DBE participation commitment in accordance with the Schedule of Participation submitted under Section 7, the Prime Contractor shall submit to MassDOT the reasons for its inability to comply with its obligations and shall submit, and request approval for, a revised Schedule of Participation. If approved by MassDOT, the revised Schedule shall govern the Prime Contractor's performance in meeting its obligations under these Special Provisions.

g. A Prime Contractor's compliance with the participation goal in Section 2 shall be determined by reference to the established percentage of the total contract price, provided, however, that no decrease in the dollar amount of a bidder's commitment to any DBE shall be allowed without the approval of MassDOT.

h. If the contract amount is increased, the Prime Contractor may be required to submit a revised Schedule of Participation in accordance with paragraphs **8.f** and **8.j** of this section.

i. In the event of the decertification of a DBE scheduled to participate on the Contract for credit toward the participation goal, but not under subcontract, the Contractor shall proceed in accordance with paragraphs **8.f** and **8.j** of this section.

j. The Prime Contractor shall notify MassDOT immediately of any facts that come to its attention indicating that it may or will be unable to comply with any aspect of its DBE obligation under this Contract.

k. Any notice required by these Special Provisions shall be given in writing to: (1) the Resident Engineer; (2) the District designated Compliance Officer; and (3) the DBE Liaison Officer, MassDOT Office of Civil Rights, 10 Park Plaza, – 3rd Floor - West, Boston, MA, 02116 and cc'd to the Deputy Chief of External Programs.

l. The Prime Contractor and its Subcontractors shall comply with MassDOT's Electronic Reporting System Requirements (MassDOT Document 00821) and submit all information required by MassDOT related to the DBE Special Provisions through the Equitable Business Opportunity Solution ("EBO"). MassDOT reserves the right to request reports in the format it deems necessary anytime during the performance of the Contract.

m. Termination of DBE by Prime Contractor

(1) A Prime Contractor shall not terminate a DBE Subcontractor or an approved substitute DBE firm without the prior written consent of MassDOT. This includes, but is not limited to, instances in which a Prime Contractor seeks to perform work originally designated for a DBE Subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm.

(2) MassDOT may provide such written consent only if MassDOT agrees, for reasons stated in its concurrence document, that the Prime Contractor has good cause to terminate the DBE firm.

(3) For purposes of this paragraph, good cause includes the following circumstances:

(i) The DBE Subcontractor fails or refuses to execute a written contract;

(ii) The DBE Subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Good cause, however, does not exist if the failure or refusal of the DBE Subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Prime Contractor;

(iii) The DBE Subcontractor fails or refuses to meet the Prime Contractor's reasonable, nondiscriminatory bond requirements.

(iv) The DBE Subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;

(v) The DBE Subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1,200 or applicable State law;

(vi) (vii) MassDOT has determined that the listed DBE Subcontractor is not a responsible contractor;

(vii) The listed DBE Subcontractor voluntarily withdraws from the Project and provides written notice of its withdrawal;

(viii) The listed DBE is ineligible to receive DBE credit for the type of work required;

(ix) A DBE owner dies or becomes disabled with the result that the listed DBE Contractor is unable to complete its work on the Contract;

(x) Other documented good cause that MassDOT determines compels the termination of the DBE Subcontractor. Good cause, however, does not exist if the Prime Contractor seeks to terminate a DBE it relied upon to obtain the Contract so that the Prime Contractor can self-perform the DBE work or substitute another DBE or non-DBE Contractor after Contract Award.

(4) Before transmitting to MassDOT a request to terminate and/or substitute a DBE Subcontractor, the Prime Contractor must give notice in writing to the DBE Subcontractor, with a copy to MassDOT, of its intent to request to terminate and/or substitute, and the reason for the request.

(5) The Prime Contractor must give the DBE five (5) business days to respond to the Prime Contractor's notice. The DBE must advise MassDOT and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why MassDOT should not approve the Prime Contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), MassDOT may provide a response period shorter than five (5) business days.

(6) In addition to post-award terminations, the provisions of this section apply to pre-award deletions of or substitutions for DBE firms.

n. Prompt Payment.

Contractors are required to promptly pay Subcontractors under this Prime Contract within ten (10) business days from the receipt of each payment the Prime Contractor receives from MassDOT. Failure to comply with this requirement may result in the withholding of payment to the Prime Contractor until such time as all payments due under this provision have been received by the Subcontractor(s) and/or referral to the Prequalification Committee for action which may affect the Contractor's prequalification status.

9. SANCTIONS

If the Prime Contractor does not comply with the terms of these Special Provisions and cannot demonstrate to the satisfaction of MassDOT that good faith efforts were made to achieve such compliance, MassDOT may, in addition to any other remedy provided for in the Contract, and notwithstanding any other provision in the Contract:

a. Retain, in connection with final acceptance and final payment processing, an amount determined by multiplying the total contract amount by the percentage in Section 2, less the amount paid to approved DBE(s) for work performed under the Contract in accordance with the provisions of Section 8.

b. Suspend, terminate or cancel this Contract, in whole or in part, and call upon the Prime Contractor's surety to perform all terms and conditions in the Contract.

c. In accordance with 720 CMR 5.05(1)(f), modify or revoke the Prime Contractor's Prequalification status or recommend that the Prime Contractor not receive award of a pending Contract. The Prime Contractor may appeal the determination of the Prequalification Committee in accordance with the provisions of 720 CMR 5.06.

d. Initiate debarment proceedings pursuant to M.G.L. c. 29 §29F and, as applicable, 2 CFR Parts 180, 215 and 1,200.

e. Refer the matter to the Massachusetts Attorney General for review and prosecution, if appropriate, of any false claim or pursuant to M.G.L. c. 12, §§ 5A to 5O (the Massachusetts False Claim Act).

f. Refer the matter to the U.S. DOT's Office of the Inspector General or other agencies for prosecution under Title 18, U.S.C. § 1001, 49 CFR Parts 29 and 31, and other applicable laws and regulations.

10. FURTHER INFORMATION; ENFORCEMENT, COOPERATION AND CONFIDENTIALITY.

a. Any proposed DBE, bidder, or Contractor shall provide such information as is necessary in the judgment of MassDOT to ascertain its compliance with the terms of this Special Provision. Further, pursuant to 49 CFR, Part 26.107:

(1) If you are a firm that does not meet the eligibility criteria of 49 CFR, Parts 26.61 to 26.73 ("subpart D"), that attempts to participate in a DOT- assisted program as a DBE on the basis of false, fraudulent, or deceitful statements or representations or under circumstances indicating a serious lack of business integrity or honesty, MassDOT or FHWA may initiate suspension or debarment proceedings against you under 49 CFR Part 29.

(2) If you are a firm that, in order to meet DBE Contract participation goals or other DBE Program requirements, uses or attempts to use, on the basis of false, fraudulent or deceitful statements or representations or under circumstances indicating a serious lack of business integrity or honesty, another firm that does not meet the eligibility criteria of subpart D, FHWA may initiate suspension or debarment proceedings against you under 49 CFR Part 29.

(3) In a suspension or debarment proceeding brought either under subparagraph a.(1) or b.(2) of this section, the concerned operating administration may consider the fact that a purported DBE has been certified by a recipient. Such certification does not preclude FHWA from determining that the purported DBE, or another firm that has used or attempted to use it to meet DBE participation goals, should be suspended or debarred.

(4) FHWA may take enforcement action under 49 CFR Part 31, Program Fraud and Civil Remedies, against any participant in the DBE Program whose conduct is subject to such action under 49 CFR Part 31.

(5) FHWA may refer to the Department of Justice, for prosecution under 18 U.S.C. 1001 or other applicable provisions of law, any person who makes a false or fraudulent statement in connection with participation of a DBE in any DOT-assisted program or otherwise violates applicable Federal statutes.

b. Pursuant to 49 CFR Part 26.109, the rules governing information, confidentiality, cooperation, and intimidation or retaliation are as follows:

(1) Availability of records.

(i) In responding to requests for information concerning any aspect of the DBE Program, FHWA complies with provisions of the Federal Freedom of Information and Privacy Acts (5 U.S.C. 552 and 552a). FHWA may make available to the public any information concerning the DBE Program release of which is not prohibited by Federal law.

(ii) MassDOT shall safeguard from disclosure to unauthorized persons information that may reasonably be considered as confidential business information, consistent with Federal and Massachusetts General Law (M.G.L. c. 66, § 10, M.G.L. c. 4, §7 (26), 950 CMR 32.00).

(2) Confidentiality of information on complainants. Notwithstanding the provisions of subparagraph b.(1) of this section, the identity of complainants shall be kept confidential, at their election. If such confidentiality will hinder the investigation, proceeding or hearing, or result in a denial of appropriate administrative due process to other parties, the complainant must be advised for the purpose of waiving the privilege. Complainants are advised that, in some circumstances, failure to waive the privilege may result in the closure of the investigation or dismissal of the proceeding or hearing.

(3) Cooperation. All participants in FHWA's DBE Program (including, but not limited to, recipients, DBE firms and applicants for DBE certification, complainants and appellants, and Contractors using DBE firms to meet Contract participation goals) are required to cooperate fully and promptly with U.S. DOT and recipient compliance reviews, certification reviews, investigations, and other requests for information. Failure to do so shall be a ground for appropriate action against the party involved (e.g., with respect to recipients, a finding of noncompliance; with respect to DBE firms, denial of certification or removal of eligibility and/or suspension and debarment; with respect to a complainant or appellant, dismissal of the complaint or appeal; with respect to a Contractor which uses DBE firms to meet participation goals, findings of non-responsibility for future Contracts and/or suspension and debarment).

(4) Intimidation and retaliation. No recipient, Contractor, or any other participant in the program, may intimidate, threaten, coerce, or discriminate against any individual or firm for the purpose of interfering with any right or privilege secured by this part or because the individual or firm has made a complaint, testified, assisted, or participated in any manner in an investigation, proceeding, or hearing under this part. If any recipient or contractor violates this prohibition, that entity is in noncompliance with this 49 CFR Part 26.

11. LIST OF ADDITIONAL DOCUMENTS.

a. The following documents shall be completed and signed by the bidder and designated DBEs in accordance with Section 7 - Award Documentation and Procedures. These documents must be returned by the bidder to MassDOT's Bid Document Distribution Center:

- □ Schedule of DBE Participation (Document B00853)
- □ Letter of Intent (Document B00854)
- □ DBE Joint Check Arrangement Approval Form (Document B00855), if Contractor and DBE plan, or if DBE is required to use a Joint Check

b. The following document shall be signed and returned by Contractor and Subcontractors/DBEs to the MassDOT District Office overseeing the Project, as applicable:

- □ Contractor/Subcontractor Certification Form (Document No. 00859) (a checklist of other documents to be included with every subcontract (DBEs and non-DBEs alike)).

c. The following document shall be provided to MassDOT's Office of Civil Rights and Prequalification Office at least fourteen (14) business days before the bid opening date, if applicable:

- □ Affidavit of DBE/Non-DBE Joint Venture (Document B00856)

d. The following document shall be provided to MassDOT's District Office of Civil Rights within 30 calendar days after the work of the DBE is completed, or no later than 30 calendar days after the work of the DBE is on a completed and processed CQE. This document shall be completed and submitted by the Prime Contractor:

- □ Certificate of Completion by a Minority/Women or Disadvantaged Business Enterprise (M/W/DBE) (Form No. CSD-100)

*** END OF DOCUMENT ***

DOCUMENT 00760

FHWA-1273 – Revised October 23, 2023

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

I. General
II. Nondiscrimination
III. Non-segregated Facilities
IV. Davis-Bacon and Related Act Provisions
V. Contract Work Hours and Safety Standards Act Provisions
VI. Subletting or Assigning the Contract
VII. Safety: Accident Prevention
VIII. False Statements Concerning Highway Projects
IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
XI. Certification Regarding Use of Contract Funds for Lobbying
XII. Use of United States-Flag Vessels:

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under title 23, United States Code, as required in 23 CFR 633.102(b) (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services). 23 CFR 633.102(e).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider. 23 CFR 633.102(e).

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services) in accordance with 23 CFR 633.102. The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in solicitation-for-bids or request-for-proposals documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract). 23 CFR 633.102(b).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract. 23 CFR 633.102(d).

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR Part 230, Subpart A, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal Employment Opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (*see* 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140, shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR Part 35 and 29 CFR Part 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract. 23 CFR 230.409 (g)(4) & (5).

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, sexual orientation, gender identity, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action or are substantially involved in such action, will be made fully cognizant of and will implement the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action

within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs (i.e., apprenticeship and on-the-job training programs for the geographical area of contract performance). In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. 23 CFR 230.409. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors, suppliers, and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:
(1) Withholding monthly progress payments;
(2) Assessing sanctions;
(3) Liquidated damages; and/or
(4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women.

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of more than $10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, the contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location under the contractor's control where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages (29 CFR 5.5)

a. *Wage rates and fringe benefits.* All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in paragraphs (d) and (e) of 29 CFR 5.5, the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act (40 U.S.C. 3141(2)(B)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.e. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in paragraph 4. of this section. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph 1.c. of this section) and the Davis-Bacon poster (WH–1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. *Frequently recurring classifications.* (1) In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in 29 CFR part 1, a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to paragraph 1.c. of this section, provided that:

(i) The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;

(ii) The classification is used in the area by the construction industry; and

(iii) The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

(2) The Administrator will establish wage rates for such classifications in accordance with paragraph 1.c.(1)(iii) of this section. Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

c. *Conformance.* (1) The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is used in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

(3) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to DBAconformance@dol.gov. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

(4) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to DBAconformance@dol.gov, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

(5) The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division under paragraphs 1.c.(3) and (4) of this section. The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 1.c.(3) or (4) of this section must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

d. *Fringe benefits not expressed as an hourly rate.* Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

e. *Unfunded plans.* If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided,* That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in § 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

f. *Interest.* In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. Withholding (29 CFR 5.5)

a. *Withholding requirements.* The contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in this section for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in paragraph 3.d. of this section, the contracting agency may on its own initiative and after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with paragraph

2.a. of this section or Section V, paragraph 3.a., or both, over claims to those funds by:

(1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;

(2) A contracting agency for its reprocurement costs;

(3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;

(4) A contractor's assignee(s);

(5) A contractor's successor(s); or

(6) A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901–3907.

3. Records and certified payrolls (29 CFR 5.5)

a. *Basic record requirements* (1) *Length of record retention.* All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.

(2) *Information required.* Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.

(3) *Additional records relating to fringe benefits.* Whenever the Secretary of Labor has found under paragraph 1.e. of this section that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

(4) *Additional records relating to apprenticeship.* Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

b. *Certified payroll requirements* (1) *Frequency and method of submission.* The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to the contracting agency. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system.

(2) *Information required.* The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under paragraph 3.a.(2) of this section, except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (*e.g.,* the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH–347 or in any other format desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division website at *https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347/.pdf* or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the contracting agency.

(3) *Statement of Compliance.* Each certified payroll submitted must be accompanied by a “Statement of Compliance,” signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

(i) That the certified payroll for the payroll period contains the information required to be provided under paragraph 3.b. of this section, the appropriate information and basic records are being maintained under paragraph 3.a. of this section, and such information and records are correct and complete;

(ii) That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

(4) *Use of Optional Form WH–347.* The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 will satisfy the requirement for submission of the “Statement of Compliance” required by paragraph 3.b.(3) of this section.

(5) *Signature.* The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

(6) *Falsification.* The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 3729.

(7) *Length of certified payroll retention.* The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

c. *Contracts, subcontracts, and related documents.* The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

d. *Required disclosures and access* (1) *Required record disclosures and access to workers.* The contractor or subcontractor must make the records required under paragraphs 3.a. through 3.c. of this section, and any other documents that the contracting agency, the State DOT, the FHWA, or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by § 5.1, available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

(2) *Sanctions for non-compliance with records and worker access requirements.* If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to § 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under 29 CFR part 6 any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

(3) *Required information disclosures.* Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address of each covered worker, and must provide them upon request to the contracting agency, the State DOT, the FHWA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. Apprentices and equal employment opportunity (29 CFR 5.5)

a. *Apprentices* (1) *Rate of pay.* Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) *Fringe benefits.* Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.

(3) *Apprenticeship ratio.* The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to paragraph 4.a.(4) of this section. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph 4.a.(1) of this section, must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(4) *Reciprocity of ratios and wage rates.* Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

b. *Equal employment opportunity.* The use of apprentices and journeyworkers under this part must be in conformity with

the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

c. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. 23 CFR 230.111(e)(2). The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeyworkers shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract as provided in 29 CFR 5.5.

6. Subcontracts. The contractor or subcontractor must insert FHWA-1273 in any subcontracts, along with the applicable wage determination(s) and such other clauses or contract modifications as the contracting agency may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate. 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility. a. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of 40 U.S.C. 3144(b) or § 5.12(a).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of 40 U.S.C. 3144(b) or § 5.12(a).

c. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, 18 U.S.C. 1001.

11. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, this part, or 29 CFR part 1 or 3;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, this part, or 29 CFR part 1 or 3;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, this part, or 29 CFR part 1 or 3; or

d. Informing any other person about their rights under the DBA, Related Acts, this part, or 29 CFR part 1 or 3.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), the following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchpersons and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. 29 CFR 5.5.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph 1. of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or

mechanic, including watchpersons and guards, employed in violation of the clause set forth in paragraph 1. of this section, in the sum currently provided in 29 CFR 5.5(b)(2)* for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1. of this section.

* $31 as of January 15, 2023 (See 88 FR 88 FR 2210) as may be adjusted annually by the Department of Labor, pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990.

3. Withholding for unpaid wages and liquidated damages

a. *Withholding process.* The FHWA or the contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in this section on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with Section IV paragraph 2.a. or paragraph 3.a. of this section, or both, over claims to those funds by:

(1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;

(2) A contracting agency for its reprocurement costs;

(3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;

(4) A contractor's assignee(s);

(5) A contractor's successor(s); or

(6) A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901–3907.

4. Subcontracts. The contractor or subcontractor must insert in any subcontracts the clauses set forth in paragraphs 1. through 5. of this section and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1. through 5. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in this part;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or this part;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or this part; or

d. Informing any other person about their rights under CWHSSA or this part.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term “perform work with its own organization” in paragraph 1 of Section VI refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions: (based on longstanding interpretation)

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), the contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. Pursuant to 23 CFR 635.116(c), the contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract. 23 CFR 635.108.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR Part 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704). 29 CFR 1926.10.

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 11, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of $150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.327.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.327.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more – as defined in 2 CFR Parts 180 and 1200. 2 CFR 180.220 and 1200.220.

1**. Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction. 2 CFR 180.320.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default. 2 CFR 180.325.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances. 2 CFR 180.345 and 180.350.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900-180.1020, and 1200. “First Tier Covered Transactions” refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction. 2 CFR 180.330.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold. 2 CFR 180.220 and 180.300.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (https://www.sam.gov/). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default. 2 CFR 180.325.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.335;.

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing 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, 2 CFR 180.800;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification, 2 CFR 180.700 and 180.800; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default. 2 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

* * * * *

3. **Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders, and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances. 2 CFR 180.365.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900 – 180.1020, and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated. 2 CFR 1200.220 and 1200.332.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold. 2 CFR 180.220 and 1200.220.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (https://www.sam.gov/), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily

excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment. 2 CFR 180.325.

* * * * *

4. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(1) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(2) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(3) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000. 49 CFR Part 20, App. A.

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, 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 Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

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

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.

2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, ‘on-board’ commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B) This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

DOCUMENT 00811

SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES
Revised: 02/03/2023

This provision applies to all projects using greater than 100 tons of hot mix asphalt (HMA) mixtures containing liquid asphalt cement as stipulated in the Notice to Contractors section of the bid documents.

Price Adjustments will be based on the variance in price, for the liquid asphalt component only, between the Base Price and the Period Price. They shall not include transportation or other charges. Price Adjustments will occur on a monthly basis.

Base Price
The Base Price of liquid asphalt on a project as listed in the Notice to Contractors section of the bid documents is a fixed price determined by the Department at the time of the bid using the same method as the determination of the Period Price detailed below. The Base Price shall be used in all bids.

Period Price
The Period Price is the price of liquid asphalt for each monthly period as determined by the Department using the average selling price per standard ton of PG64-28 paving grade (primary binder classification) asphalt, FOB manufacturer's terminal, as listed under the "East Coast Market - New England, Boston, Massachusetts area" section of the Poten & Partners, Inc. "Asphalt Weekly Monitor". This average selling price is listed in the issue having a publication date of the second Friday of the month and will be posted as the Period Price for that month. The Department will post this Period Price on its website at https://www.mass.gov/service-details/massdot-current-contract-price-adjustments following its receipt of the relevant issue of the "Asphalt Weekly Monitor". Poten and Partners has granted the Department the right to publish this specific asphalt price information sourced from the Asphalt Weekly Monitor.

Price Adjustment Determination, Calculation and Payment
The Contract Price of the HMA mixture will be paid under the respective item in the Contract. Price Adjustments, as herein provided, either upwards or downwards, will be made after the work has been performed using the monthly period price for the month during which the work was performed.

Price Adjustments will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the approved Job Mix Formula.

Price Adjustments will be separate payment items. The pay item numbers are 999.401 for a positive price adjustment (a payment) and 999.402 for a negative price adjustment (a deduction). Price Adjustments will be calculated using the following equation:

Price Adjustment = Tons of HMA Placed X Liquid Asphalt Content % X RAP Factor X (Period Price - Base Price)

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

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DOCUMENT 00812

SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE –
ENGLISH UNITS
Revised: 02/01/2021

This monthly fuel price adjustment is inserted in this contract because the national and worldwide energy situation has made the future cost of fuel unpredictable. This adjustment will provide for either additional compensation to the Contractor or repayment to the Commonwealth, depending on an increase or decrease in the average price of diesel fuel or gasoline.

This adjustment will be based on fuel usage factors for various items of work developed by the Highway Research Board in Circular 158, dated July 1974. These factors will be multiplied by the quantities of work done in each item during each monthly period and further multiplied by the variance in price from the Base Price to the Period Price.

The Base Price of Diesel Fuel and Gasoline will be the price as indicated in the Department's web site https://www.mass.gov/service-details/massdot-current-contract-price-adjustments for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices charged to the State, including State Tax for the bulk purchases made during each month.

This adjustment will be effected only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No adjustment will be paid for work done beyond the extended completion date of any contract.

Any adjustment (increase or decrease) to estimated quantities made to each item at the time of final payment will have the fuel price adjustment figured at the average period price for the entire term of the project for the difference of quantity.

The fuel price adjustment will apply only to the following items of work at the fuel factors shown:

ITEMS COVERED	FUEL FACTORS	
	Diesel	Gasoline
Excavation: and Borrow Work: Items 120, 120.1, 121, 123, 124, 125, 127, 129.3, 140, 140.1, 141, 142, 143, 144, 150, 150.1, 151 and 151.1 (Both Factors used)	0.29 Gallons / CY.	0.15 Gallons / CY
Surfacing Work: All Items containing Hot Mix Asphalt	2.90 Gallons / Ton	Does Not Apply

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DOCUMENT 00813

SPECIAL PROVISIONS

PRICE ADJUSTMENTS FOR STRUCTURAL STEEL AND REINFORCING STEEL

July 16, 2025

This special provision applies to all projects containing the use of structural steel and/or reinforcing steel as specified elsewhere in the Contract work. It applies to all structural steel and all reinforcing steel, as defined below, on the project. Compliance with this provision is mandatory, i.e., there are no "opt-in" or "opt-out" clauses. Price adjustments will be handled as described below and shall only apply to unfabricated reinforcing steel bars and unfabricated structural steel material, consisting of rolled shapes, plate steel, sheet piling, pipe piles, steel castings and steel forgings.

Price adjustments will be variances between Base Prices and Period Prices. Base Prices and Period Prices are defined below.

Price adjustments will only be made if the variances between Base Prices and Period Prices are 5% or more. A variance can result in the Period Price being either higher or lower than the Base Price. Once the 5% threshold has been achieved, the adjustment will apply to the full variance between the Base Price and the Period Price.

Price adjustments will be calculated by multiplying the number of pounds of unfabricated structural steel material or unfabricated reinforcing steel bars on a project by the index factor calculated as shown below under Example of a Period Price Calculation.

Price adjustments will ***not*** include guardrail panels or the costs of shop drawing preparation, handling, fabrication, coatings, transportation, storage, installation, profit, overhead, fuel costs, fuel surcharges, or other such charges not related to the cost of the unfabricated structural steel and unfabricated reinforcing steel.

The weight of steel subject to a price adjustment shall not exceed the final shipping weight of the fabricated part by more than 10%.

Base Prices and Period Prices are defined as follows:

Base Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are fixed prices determined by the Department and found in the table below. While it is the intention of the Department to make this table comprehensive, some of a project's unfabricated structural steel and/or unfabricated reinforcing steel may be inadvertently omitted. Should this occur, the Contractor shall bring the omission to the Department's attention so that a contract alteration may be processed that adds the missing steel to the table and its price adjustments to the Contract.

The Base Price Date is the month and year of the most recent finalized period price index at the time that MassDOT opened bids for the project. The Base Price Index for this contract is the Steel PPI listed in the Notice to Contractors.

Period Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are variable prices that have been calculated using the Period Price Date and an index of steel prices to adjust the Base Price.

The Period Price Date is the date the steel was delivered to the fabricator as evidenced by an official bill of lading submitted to the Department containing a description of the shipped materials, weights of the shipped materials and the date of shipment. This date is used to select the Period Price Index.

The index used for the calculation of Period Prices is the U.S. Department of Labor Bureau of Labor Statistics Producer Price Index (PPI) Series ID WPU101702 (Not Seasonally Adjusted, Group: Metals and Metal Products, Item: Semi-finished Steel Mill Products.) As this index is subject to revision for a period of up to four (4) months after its original publication, no price adjustments will be made until the index for the period is finalized, i.e., the index is no longer suffixed with a "(P)".

Period Prices are determined as follows:

Period Price = Base Price X Index Factor
Index Factor = Period Price Index / Base Price Index

Example of a Period Price Calculation:

Calculate the Period Price for December 2009 using a Base Price from March 2009 of $0.82/Pound for 1,000 Pounds of ASTM A709 (AASHTO M270) Grade A36 Structural Steel Plate.

The Period Price Date is December 2009. From the PPI website*, the Period Price Index = 218.0.

The Base Price Date is March 2009. From the PPI website*, the Base Price Index = 229.4.

Index Factor = Period Price Index / Base Price Index = 218.0 / 229.4 = 0.950
Period Price = Base Price X Index Factor = $0.82/Pound X 0.950 = $0.78/Pound

Since $0.82 - $0.78 = $0.04 is less than 5% of $0.82, no price adjustment is required.

If the $0.04 difference shown above was greater than 5% of the Base Price, then the price adjustment would be 1,000 Pounds X $0.04/Pound = $40.00. Since the Period Price of $0.78/Pound is less than the Base Price of $0.82/Pound, indicating a drop in the price of steel between the bid and the delivery of material, a credit of $40.00 would be owed to MassDOT. When the Period Price is higher than the Base Price, the price adjustment is owed to the Contractor.

* To access the PPI website and obtain a Base Price Index or a Period Price Index, go to http://data.bls.gov/cgi-bin/srgate

End of example.

The Contractor will be paid for unfabricated structural steel and unfabricated reinforcing steel under the respective contract pay items for all components constructed of either structural steel or reinforced Portland cement concrete under their respective Contract Pay Items.

Price adjustments, as herein provided for, will be paid separately as follows:

Structural Steel
Pay Item Number 999.449 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.457 for negative (-) pay adjustments (credits to MassDOT Highway Division)

Reinforcing Steel
Pay Item Number 999.466 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.467 for negative (-) pay adjustments (credits to MassDOT Highway Division)

No price adjustment will be made for price changes after the Contract Completion Date, unless the MassDOT Highway Division has approved an extension of Contract Time for the Contract.

TABLE

Steel Type		Price per Pound
1	ASTM A615/A615M Grade 60 (AASHTO M31 Grade 60 or 420) Reinforcing Steel	$0.53
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note below.)	$0.74
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	$0.74
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	$0.76
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	$0.79
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	$0.75
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	$0.79
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	$0.75
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	$0.82
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	$0.76
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	$0.82
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	$0.76
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	$0.86
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	$0.93
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	$1.42
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	$0.82
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	$0.76
18	ASTM A276 Type 316 Stainless Steel	$4.26
19	ASTM A240 Type 316 Stainless Steel	$4.26
20	ASTM A148 Grade 80/50 Steel Castings (See Note below.)	$1.46
21	ASTM A53 Grade B Structural Steel Pipe	$0.93
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	$0.93
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	$0.74
24	ASTM 252, Grade 2 Permanent Steel Casing	$0.74
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	$0.78
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	$1.40
27	ASTM A572 / A572M, Grade 50 Sheetpiling	$1.40
28	ASTM A36/36M, Grade 50	$0.79
29	ASTM A570, Grade 50	$0.78
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	$0.79
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	$0.93
32	AREA 140 LB Rail and Track Accessories	$0.48

NOTE: Steel Castings are generally used only on moveable bridges. Cast iron frames, grates and pipe are not “steel” castings and will not be considered for price adjustments.

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DOCUMENT 00814

SPECIAL PROVISIONS
PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES

January 12, 2009

This provision applies to all projects using greater than 100 Cubic Yards (76 Cubic Meters) of Portland cement concrete containing Portland cement as stipulated in the Notice to Contractors section of the Bid Documents. This Price Adjustment will occur on a monthly basis.

The Price Adjustment will be based on the variance in price for the Portland cement component only from the Base Price to the Period Price. It shall not include transportation or other charges.

The Base Price of Portland cement on a project is a fixed price determined at the time of bid by the Department by using the same method as for the determination of the Period Price (see below) and found in the Notice to Contractors.

The Period Price of Portland cement will be determined by using the latest published price, in dollars per ton (U.S.), for Portland cement (Type I) quoted for Boston, U.S.A. in the **Construction Economics** section of *ENR Engineering News-Record* magazine or at the ENR website http://www.enr.com under **Construction Economics**. The Period Price will be posted on the MassDOT website the Wednesday immediately following the publishing of the monthly price in ENR, which is normally the first week of the month.

The Contract Price of the Portland cement concrete mix will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The price adjustment applies only to the actual Portland cement content in the mix placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M4.02.01. No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of cubic yards of Portland cement concrete placed during each monthly period times the Portland cement content percentage times the variance in price between the Base Price and Period Price of Portland cement.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

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DOCUMENT 00820

THE COMMONWEALTH OF MASSACHUSETTS
SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

I. Definitions

For purposes of this contract,

"Minority" means a person who meets one or more of the following definitions:

(a) American Indian or Native American means: all persons having origins in any of the original peoples of North America and who are recognized as an Indian by a tribe or tribal organization.
(b) Asian means: All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian sub-continent, or the Pacific Islands, including, but Not limited to China, Japan, Korea, Samoa, India, and the Philippine Islands.
(c) Black means: All persons having origins in any of the Black racial groups of Africa, including, but not limited to, African-Americans, and all persons having origins in any of the original peoples of the Cape Verdean Islands.
(d) Eskimo or Aleut means: All persons having origins in any of the peoples of Northern Canada, Greenland, Alaska, and Eastern Siberia.
(e) Hispanic means: All persons having their origins in any of the Spanish-speaking peoples of Mexico, Puerto Rico, Cuba, Central or South America, or the Caribbean Islands.

"State construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility, or a contract for the construction, reconstruction, alteration, remodeling or repair of a public work undertaken by a department, agency, board, or commission of the commonwealth.

"State assisted construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility undertaken by a political subdivision of the commonwealth, or two or more political subdivisions thereof, an authority, or other instrumentality and whose costs of the contract are paid for, reimbursed, grant funded, or otherwise supported, in whole or in part, by the commonwealth.

II. Equal Opportunity, Non-Discrimination and Affirmative Action

During the performance of this Contract, the Contractor and all subcontractors (hereinafter collectively referred to as "the Contractor") for a state construction contract or a state assisted construction contract, for him/herself, his/her assignees and successors in interest, agree to comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

In connection with the performance of work under this contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability, shall not discriminate in the selection or retention of subcontractors, and shall not discriminate in the procurement of materials and rentals of equipment.

The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising, layoff or termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship or on-the-job training opportunity. The Contractor shall comply with the provisions of chapter 151B of the Massachusetts General Laws, as amended, and all other applicable anti-discrimination and equal opportunity laws, all of which are herein incorporated by reference and made a part of this Contract.

The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Massachusetts Commission Against Discrimination setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter l51 B).

In connection with the performance of work under this contract, the Contractor shall undertake, in good faith, affirmative action measures to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. Such affirmative action measures shall entail positive and aggressive measures to ensure nondiscrimination and to promote equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, apprenticeship and on-the-job training programs. A list of positive and aggressive measures shall include, but not be limited to, advertising employment opportunities in minority and other community news media; notifying minority, women and other community-based organizations of employment opportunities; validating all job specifications, selection requirements, and tests; maintaining a file of names and addresses of each worker referred to the Contractor and what action was taken concerning such worker; and notifying the administering agency in writing when a union with whom the Contractor has a collective bargaining agreement has failed to refer a minority or woman worker. These and other affirmative action measures shall include all actions required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. One purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future Commonwealth public construction projects.

III. Minority and Women Workforce Participation

Pursuant to his/her obligations under the preceding section, the Contractor shall strive to achieve on this project the labor participation goals contained herein. Said participation goals shall apply in each job category on this project including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers and those classes of work enumerated in Section 44F of Chapter 149 of the Massachusetts General Laws. The participation goals for this project shall be 15.3% for minorities and 6.9% for women. The participation goals, as set forth herein, shall not be construed as quotas or set-asides; rather, such participation goals will be used to measure the progress of the Commonwealth's equal opportunity, non-discrimination and affirmative action program. Additionally, the participation goals contained herein should not be seen or treated as a floor or as a ceiling for the employment of particular individuals or group of individuals.

IV. Liaison Committee

At the discretion of the agency that administers the contract for the construction project there may be established for the life of the contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the agency or agencies administering the contract for the construction project, hereinafter called the administering agency, a representative from the Office of Affirmative action, and such other representatives as may be designated by the administering agency. The Contractor (or his/her agent, if any, designated by him/her as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

V. Reports and Records

The Contractor shall prepare projected workforce tables on a quarterly basis when required by the administering agency. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also, when updated, to the administering agency and the Liaison Committee when required.

The Contractor shall prepare weekly reports in a form approved by the administering agency, unless information required is required to be reported electronically by the administering agency, the number of hours worked in each trade by each employee, identified as woman, minority, or non-minority. Copies of these shall be provided at the end of each such week to the administering agency and the Liaison Committee.

Records of employment referral orders, prepared by the Contractor, shall be made available to the administering agency on request.

The Contractor will provide all information and reports required by the administering agency on instructions issued by the administering agency and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the administering agency to effect the employment of personnel. This provision shall apply only to information pertinent to the Commonwealth's supplementary non-discrimination, equal opportunity and access and opportunity contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the administering agency and shall set forth what efforts he has made to obtain the information.

VI. Access to Work Site

A designee of the administering agency and a designee of the Liaison Committee shall each have a right to access the work site.

VII. Solicitations for Subcontracts, and for the Procurement of Materials and Equipment

In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this contract relative to non-discrimination and equal opportunity.

VIII. Sanctions

Whenever the administering agency believes the General or Prime Contractor or any subcontractor may not be operating in compliance with the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151B), the administering agency may refer the matter to the Massachusetts Commission Against Discrimination ("Commission") for investigation.

Following the referral of a matter by the administering agency to the Massachusetts Commission Against Discrimination, and while the matter is pending before the MCAD, the administering agency may withhold payments from contractors and subcontractors when it has documentation that the contractor or subcontractor has violated the Fair Employment Practices Law with respect to its activities on the Project, or if the administering agency determines that the contractor has materially failed to comply with its obligations and the requirements of this Section. The amount withheld shall not exceed a withhold of payment to the General or Prime Contractor of 1/100 or 1% of the contract award price or $5,000, whichever sum is greater, or, if a subcontractor is in non-compliance, a withhold by the administering agency from the General Contractor, to be assessed by the General Contractor as a charge against the subcontractor, of 1/100 or 1% of the subcontractor price, or $1,000 whichever sum is greater, for each violation of the applicable law or contract requirements. The total withheld from anyone General or Prime Contractor or subcontractor on a Project shall not exceed $20,000 overall. No withhold of payments or investigation by the Commission or its agent shall be initiated without the administering agency providing prior notice to the Contractor.

If, after investigation, the Massachusetts Commission Against Discrimination finds that a General or Prime Contractor or subcontractor, in commission of a state construction contract or state-assisted construction contract, violated the provisions of the Fair Employment Practices Law, the administering agency may convert the amount withheld as set forth above into a permanent sanction, as a permanent deduct from payments to the General or Prime Contractor or subcontractor, which sanction will be in addition to any such sanctions, fines or penalties imposed by the Massachusetts Commission Against Discrimination.

No sanction enumerated under this Section shall be imposed by the administering agency except after notice to the General or Prime Contractor or subcontractor and an adjudicatory proceeding, as that term is used, under Massachusetts General Laws Chapter 30A, has been conducted.

IX. Severability

The provisions of this section are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

X. Contractor's Certification

After award and prior to the execution of any contract for a state construction contract or a state assisted construction contract, the Prime or General Contractor shall certify that it will comply with all provisions of this Document 00820 Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program, by executing Document 00859 Contractor/Subcontractor Certification Form.

XI. Subcontractor Requirements

Prior to the award of any subcontract for a state construction contract or a state assisted construction contract, the Prime or General Contractor shall provide all prospective subcontractors with a complete copy of this Document 00820 entitled "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" and will incorporate the provisions of this Document 00820 into any and all contracts or work orders for all subcontractors providing work on the Project. In order to ensure that the said subcontractor's certification becomes a part of all subcontracts under the prime contract, the Prime or General Contractor shall certify in writing to the administering agency that it has complied with the requirements as set forth in the preceeding paragraph by executing Document 00859 Contractor/Subcontractor Certification Form.

Rev'd 03/07/14

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DOCUMENT 00821

ELECTRONIC REPORTING REQUIREMENTS
CIVIL RIGHTS PROGRAMS AND CERTIFIED PAYROLL

Implemented on March 2, 2009 Revised June 04, 2019

The Massachusetts Department Of Transportation (MassDOT) has replaced the CHAMP reporting system with Equitable Business Opportunity Solution (EBO), a new web-based civil rights reporting software system. This system is capable of handling both civil rights reporting requirements and certified payrolls. The program's functions include the administration of Equal Employment Opportunity (EEO) requirements, On-The-Job Training requirements (OJT), Disadvantage Business Enterprise (DBE) and/or Minority / Women's Business Enterprise (M/WBE) subcontracting requirements, and the electronic collection of certified payrolls associated with MassDOT projects. In addition, this system is used to generate various data required as part of the American Recovery and Reinvestment Act (ARRA). Contractors are responsible for all coordination with all sub-contractors to ensure timely and accurate electronic submission of all required data.

Contractor and Sub-Contractor EBO User Certification

All contractors and sub-contractors must use the EBO software system. The software vendor, Internet Government Solutions (IGS), has developed an online EBO Training Module that is available to contractors and sub-contractors. This module is a self-tutorial which allows all users in the company to access the training, complete the tutorial, and become certified as EBO users for a one time fee of $75.00. This is the only cost to contractors and sub-contractors associated with the EBO software system. The online EBO Training Module can be accessed at www.ebotraining.com. Click the "Register My Company" button on the login page to begin your training registration. Questions regarding EBO online training should be directed to Gerry Anguilano, IGS at (440) 238-1684.

MassDOT will track contractors and sub-contractors who have successfully completed the on-line training module. All persons performing civil rights program and/or certified payroll functions should be EBO certified.

Vetting of Firms and Designated Firm Individuals

Contractors must authorize a Primary Log-In ID Holder who has completed EBO on-line training to have access to the EBO system by completing and submitting the "Request For EBO System Log-In/Password Form" located on the MassDOT website at: https://www.mass.gov/how-to/how-to-get-an-ebo-login
Contractors must also agree to comply with the EBO system user agreement located on the MassDOT website.

All subcontracts entered into on a project must include language that identifies the submission and training requirements that the sub-contractor must perform. Sub-contractors will be approved by the respective District Office of MassDOT through the existing approval process. When new sub-contractors, who have not previously worked for MassDOT, are initially selected by a general contractor, the new sub-contractor must be approved by the District before taking the EBO on-line training module.

Interim Reporting Requirements

Until MassDOT is satisfied that the EBO system is fully operational and functioning as designed, contractors and sub-contractors will be required to submit certified payrolls manually. There will be a transition period where dual reporting, through manual and electronic submission, will be required. MassDOT, however, will notify contractors and sub-contractors when they may cease manual submission of certified payrolls.

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DOCUMENT 00859

CONTRACTOR/SUBCONTRACTOR CERTIFICATION FORM ‡

The contractor shall submit this completed document 00859 to MassDOT for each subcontract.

_____ **(Contractor)** **Date:**_____

_____**(Subcontractor)** ☐ District Approved Subcontractor

Contract No: 131468 **Project No.** 608491 **Federal Aid No.:** NHP(NHS)-003S(866)X

Location: MENDON

Project Description: Resurfacing and Related Work on Route 16

PART 1 CONTRACTOR CERTIFICATION: I hereby certify, as an authorized official of this company, that to the best of my knowledge, information and belief, the company is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices, that the company will not discriminate in their employment practices, that the company will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained in Contract Document 00820 The Commonwealth of Massachusetts Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program, and that the company will comply with the special provisions and documentation indicated below (as checked).

I further hereby certify, as an authorized official of this company, that the special provisions and documentation indicated below (as checked) have been or are included in, and made part of, the Subcontractor Agreement entered into with the firm named above.

☐ **This is not a Federally-aided construction project**

Document #

☐ 00718 –Participation By Minority Or Women's Business Enterprises and SDVOBE†
☐ 00761 –Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
☐ 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program
☐ 00821 – Electronic Reporting Requirements, Civil Rights Programs, and Certified Payroll
☐ 00859 – Contractor/Subcontractor Certification Form (this document)
☐ 00860 – MA Employment Laws
☐ 00861 – Applicable State Wage Rates in the Contract Proposal**
☐ B00842 – MA Schedule of Participation By Minority or Women Business Enterprises (M/WBEs)†
☐ B00843 – MA Letter of Intent – M/WBEs†

** Does not apply to Material Suppliers, unless performing work on-site
† Applies only if Subcontractor is a M/WBE; only include these forms for the particular M/WBE Entity

☐ B00844 - Schedule of Participation By SDVOBE
☐ B00845 - Letter of Intent – SDVOBE
☐ B00846 – M/WBE or SDVOBE Joint Check Arrangement Approval Form
☐ B00847 – Joint Venture Affidavit

☐ **This is a Federally-aided construction project (Federal Aid Number is present)**

Document #

☐ 00719 – Special Provisions for Participation by Disadvantaged Business Enterprises†
☐ 00760 - Form FHWA 1273 - Required Contract Provisions for Federal-Aid Construction Contracts
☐ 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program
☐ 00821 – Electronic Reporting Requirements, Civil Rights Programs and Certified Payroll
☐ 00859 – Contractor/Subcontractor Certification Form (this document)
☐ 00860 – MA Employment Laws
☐ 00870 – Standard Federal Equal Employment Opportunity Construction Contract Specifications Executive Order 11246, (41 CFR Parts 60-4.2 and 60-4.3 (Solicitations and Equal Opportunity Clauses)*
☐ 00875 – Federal Trainee Special Provisions

☐ B00853 – Schedule of Participation by Disadvantaged Business Enterprise†
☐ B00854 – Letter of Intent – DBEs†
☐ B00855 – DBE Joint Check Arrangement Approval Form
☐ B00856 – Joint Venture Affidavit
☐ 00861/00880 - Applicable state and federal wage rates from Contract Proposal**

*Applicable only to Contracts or Subcontracts in excess of $10,000
**Does not apply to Material Suppliers, unless performing work on-site
† Applies only if Subcontractor is a DBE; only include these forms for the particular DBE Entity

Signed this _____ Day of _____, 20_____ Under The Pains And Penalties Of Perjury.

_____ _____
(Print Name and Title) (Authorized Signature)

PART 2

PART 2 SUBCONTRACTOR CERTIFICATION: I hereby certify, as an authorized official of this company, that the required documents in Part 1 above were physically incorporated in our Agreement/Subcontract with the Contractor and give assurance that this company will fully comply or make every good faith effort to comply with the same. I further certify that:

1. This company recognizes that if this is a Federal-Aid Project, then this Contract is covered by the equal employment opportunity laws administered and enforced by the United States Department of Labor ("USDOL"), Office of Federal Contract Compliance Programs ('OFCCP"). By signing below, we acknowledge that this company has certain reporting obligations to the OFCCP, as specified by 41 CFR Part 60-4.2.
2. This company further acknowledges that any contractor with fifty (50) or more employees on a Federal-aid Contract with a value of fifty-thousand ($50,000) dollars or more must annually file an EEO-1 Report (SF 100) to the EEOC, Joint Reporting Committee, on or before September 30th, each year, as specified by 41 CFR Part 60-1.7a.
3. For more information regarding the federal reporting requirements, please contact the USDOL, OFCCP Regional Office, at 1-646-264-3170 or EEO-1, Joint Reporting Committee at 1-866-286-6440. You may also find guidance at: http://www.dol.gov/ofccp/TAguides/consttag.pdf or http://www.wdol.gov/dba.aspx#0.
4. This company ☐ has, ☐ has not, participated in a previous contract or subcontract subject to the Equal Opportunity clauses set forth in 41 CFR Part 60-4 and Executive Order 11246, and where required, has filed with the Joint Reporting Committee, the Director of the Office of Federal Contract Compliance Programs or the EEO Commission all reports due under the applicable filing requirements.
5. This company is in full compliance with applicable Federal and Commonwealth of Massachusetts laws, rules, and regulations and is not currently debarred or disqualified from bidding on or participating in construction contracts in any jurisdiction of the United States. See : https://www.mass.gov/service-details/contractors-and-vendors-suspended-or-debarred-by-massdot
6. This company is properly registered and in good standing with the Office of the Secretary of the Commonwealth.

Signed this _____ Day of _____, 20_____, Under The Pains And Penalties Of Perjury.

Firm: _____
Address: _____
_____
_____
Telephone Number:_____
Federal I.D. Number:_____
Estimated Start Date:_____
Estimated Completion Date:_____
Estimated Dollar Amount:_____

_____
(Print Name and Title)

_____
(Authorized Signature)

_____
(Date)

Rev'd 09/02/22

*** END OF DOCUMENT ***

DOCUMENT 00860

COMMONWEALTH OF MASSACHUSETTS PUBLIC EMPLOYMENT LAWS

Revised February 20, 2019

The Contractor's attention is directed to Massachusetts General Laws, Chapter 149, Sections 26 through 27H, and 150A. This contract is considered to fall within the ambit of that law, which provides that in general, the Prevailing Rate or Total Rate must be paid to employees working on projects funded by the Commonwealth of Massachusetts or any political subdivision including Massachusetts Department of Transportation (MassDOT).

A Federal Aid project is also subject to the Federal Minimum Wage Rate law for construction. When comparing a state minimum wage rate, monitored by the Massachusetts Attorney General, versus federal minimum wage rate, monitored by the U.S. Department of Labor Wage and Hour Division, for a particular job classification the higher wage is at all times to be paid to the affected employee.

Every contractor or subcontractor engaged in this contract to which sections twenty-seven and twenty-seven A apply will keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee on this contract, and the hours worked by, and the wages paid to, each such employee, and shall furnish to the MassDOT's Resident Engineer, on a weekly basis, a copy of said record, in a form approved by MassDOT and in accordance with M.G.L. c. 149, § 27B, signed by the employer or his/her authorized agent under the penalties of perjury.

Each such contractor or subcontractor shall preserve its payroll records for a period of three years from the date of completion of the contract.

The Prevailing Wage Rate generally includes the following:

> Minimum Hourly Wage + Employer Contributions to Benefit Plans = Prevailing Wage Rate or Total Rate
>
> Any employer who does not make contributions to Benefit Plans must pay the total Prevailing Wage Rate directly to the employee.

Any deduction from the Prevailing Wage Rate or Total Rate for contributions to benefit plans can only be for a Health & Welfare, Pension, or Supplementary Unemployment plan meeting the requirements of the Employee Retirement Income Security Act (ERISA) of 1974. The maximum allowable deduction for these benefits from the prevailing wage rate cannot be greater than the amount allowed by Executive Office of Labor (EOL) for the specified benefits. Any additional expense of providing benefits to the employees is to be borne by the employer and cannot be deducted from the Minimum Hourly Wage. If the employer's benefit expense is less than that so provided by EOL the difference will be paid directly to the employee. The rate established must be paid to all employees who perform work on the project.

When an employer makes deductions from the Minimum Hourly Wage for an employee's contribution to social security, state taxes, federal taxes, and/or other contribution programs, allowed by law, the employer shall furnish each employee a suitable pay slip, check stub or envelope notifying the employee of the amount of the deductions.

No contractor or subcontractor contracting for any part of the contract week shall require or permit any laborer or mechanic to be employed on such work in excess of forty hours in any workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay for all hours worked in excess of forty hours in such workweek, whichever is the greater number of overtime hours.

Apprentice Rates are permitted only when there is an Apprentice Agreement registered with the Massachusetts Division of Apprentice Training in accordance with M.G.L. c. 23, § 11E-11L.

The Prevailing Wage Rates issued for each project shall be the rates paid for the entire project. The Prevailing Wage Rates must be posted on the job site at all times and be visible from a public way.

In addition, each such contractor and subcontractor shall furnish to the MassDOT's Resident Engineer, within fifteen days after completion of its portion of the work, a statement, executed by the contractor or subcontractor or by any authorized officer or employee of the contractor or subcontractor who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

Date: _____

I , _____do hereby state:
(Name of signatory party) (Title)

That I pay or supervise the payment of the persons employed by:

_____
(Contractor or Subcontractor)

on the _____
(MassDOT Project Location and Contract Number)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty-nine of the General Laws.

Signature _____

Title _____

The above-mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the MassDOT's Resident Engineer for such inspection and copying.

Massachusetts General Laws c. 149, §27, requires annual updates to prevailing wage schedules for all public construction contracts lasting longer than one year. MassDOT will request the required updates and furnish them to the Contractor. The Contractor is required to pay no less than the wage rates indicated on the annual updated wage schedules.

MassDOT will request the updates no later that two week before the anniversary of the Notice to Proceed date of the contract to allow for adequate processing by the Department of Labor Standards (DLS). The effective date for the new rates will be the anniversary date of the contract (i.e. the notice to proceed date), regardless of the date of issuance on the schedule from DLS.

All bidders are cautioned that the aforementioned laws require that employers pay to covered employees no less than the applicable minimum wages. In addition, the same laws require that the applicable prevailing wages become incorporated as part of this contract. The prevailing minimum wage law establishes serious civil and criminal penalties for violations, including imprisonment and exclusion from future public contracts. Bidders are cautioned to carefully read the relevant sections of the Massachusetts General Laws.

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DOCUMENT 00861

STATE PREVAILING WAGE RATES

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THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS
Prevailing Wage Rates

MAURA HEALY
Governor
KIM DRISCOLL
Lt. Governor

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority:	MassDOT Highway	**City/Town:**	MENDON
Contract Number:	131468		
Description of Work:	MENDON - Federal Aid Project No. NHP(NHS)-003S(866)X Resurfacing and Related Work on Route 16		
Job Location:	Along Route 16		

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.
- This annual update requirement is generally not applicable to 27F “rental of equipment” contracts. For such contracts, the prevailing wage rates issued by DLS shall remain in effect for the duration of the contract term. However, if the prevailing wage rate sheet issued does not contain wage rates for each year covered by the contract term, the Awarding Authority must request updated rate sheets from DLS and provide them to the contractor to ensure the correct rates are being paid throughout the duration of the contract. Additionally, if an Awarding Authority exercises an option to renew or extend the contract term, they must request updated rate sheets form DLS and provide them to the contractor.
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the “Wage Request Number” on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee’s name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$40.95	$15.57	$20.17	$0.00	$0.00	$76.69
	12/1/2025	$40.95	$15.57	$21.78	$0.00	$0.00	$78.30
	1/1/2026	$40.95	$16.17	$21.78	$0.00	$0.00	$78.90
	6/1/2026	$41.95	$16.17	$21.78	$0.00	$0.00	$79.90
	12/1/2026	$41.95	$16.17	$23.52	$0.00	$0.00	$81.64
	1/1/2027	$41.95	$16.77	$23.52	$0.00	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.02	$15.57	$20.17	$0.00	$0.00	$76.76
	12/1/2025	$41.02	$15.57	$21.78	$0.00	$0.00	$78.37
	1/1/2026	$41.02	$16.17	$21.78	$0.00	$0.00	$78.97
	6/1/2026	$42.02	$16.17	$21.78	$0.00	$0.00	$79.97
	12/1/2026	$42.02	$16.17	$23.52	$0.00	$0.00	$81.71
	1/1/2027	$42.02	$16.77	$23.52	$0.00	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.14	$15.57	$20.17	$0.00	$0.00	$76.88
	12/1/2025	$41.14	$15.57	$21.78	$0.00	$0.00	$78.49
	1/1/2026	$41.14	$16.17	$21.78	$0.00	$0.00	$79.09
	6/1/2026	$42.14	$16.17	$21.78	$0.00	$0.00	$80.09
	12/1/2026	$42.14	$16.17	$23.52	$0.00	$0.00	$81.83
	1/1/2027	$42.14	$16.77	$23.52	$0.00	$0.00	$82.43
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 2) For apprentice rates see "Apprentice- PILE DRIVER"	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
AIR TRACK OPERATOR LABORERS LABORERS - ZONE 2	6/1/2025	$41.09	$9.90	$9.25	$9.11	$0.00	$69.35
	12/1/2025	$42.47	$9.90	$9.25	$9.11	$0.00	$70.73
	6/1/2026	$43.91	$9.90	$9.25	$9.11	$0.00	$72.17
	12/1/2026	$45.35	$9.90	$9.25	$9.11	$0.00	$73.61
	6/1/2027	$46.80	$9.90	$9.25	$9.11	$0.00	$75.06
	12/1/2027	$48.25	$9.90	$9.25	$9.11	$0.00	$76.51
	6/1/2028	$49.75	$9.90	$9.25	$9.11	$0.00	$78.01
	12/1/2028	$51.25	$9.90	$9.25	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2025	$41.09	$9.90	$9.25	$9.21	$0.00	$69.45
	12/1/2025	$42.47	$9.90	$9.25	$9.21	$0.00	$70.83
	6/1/2026	$43.91	$9.90	$9.25	$9.21	$0.00	$72.27
	12/1/2026	$45.35	$9.90	$9.25	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
ASBESTOS WORKER (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (WORCESTER)	6/1/2025	$43.80	$14.50	$4.30	$6.75	$0.00	$69.35
	12/1/2025	$44.80	$14.50	$4.30	$6.75	$0.00	$70.35
ASPHALT RAKER LABORERS LABORERS - ZONE 2	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
ASPHALT RAKER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2025	$40.59	$9.90	$9.25	$9.21	$0.00	$68.95
	12/1/2025	$41.97	$9.90	$9.25	$9.21	$0.00	$70.33
	6/1/2026	$43.41	$9.90	$9.25	$9.21	$0.00	$71.77
	12/1/2026	$44.85	$9.90	$9.25	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$58.33	$15.55	$13.25	$3.25	$0.00	$90.38
	12/1/2025	$59.78	$15.55	$13.25	$3.25	$0.00	$91.83
	6/1/2026	$61.08	$15.55	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.53	$15.55	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BACKHOE/FRONT-END LOADER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$58.33	$15.55	$13.25	$3.25	$0.00	$90.38
	12/1/2025	$59.78	$15.55	$13.25	$3.25	$0.00	$91.83
	6/1/2026	$61.08	$15.55	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.53	$15.55	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BARCO-TYPE JUMPING TAMPER LABORERS LABORERS - ZONE 2	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER LABORERS LABORERS - ZONE 2	6/1/2025	$41.09	$9.90	$9.25	$9.11	$0.00	$69.35
	12/1/2025	$42.47	$9.90	$9.25	$9.11	$0.00	$70.73
	6/1/2026	$43.91	$9.90	$9.25	$9.11	$0.00	$72.17
	12/1/2026	$45.35	$9.90	$9.25	$9.11	$0.00	$73.61
	6/1/2027	$46.80	$9.90	$9.25	$9.11	$0.00	$75.06
	12/1/2027	$48.25	$9.90	$9.25	$9.11	$0.00	$76.51
	6/1/2028	$49.75	$9.90	$9.25	$9.11	$0.00	$78.01
	12/1/2028	$51.25	$9.90	$9.25	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2025	$41.09	$9.90	$9.25	$9.21	$0.00	$69.45
	12/1/2025	$42.47	$9.90	$9.25	$9.21	$0.00	$70.83
	6/1/2026	$43.91	$9.90	$9.25	$9.21	$0.00	$72.27
	12/1/2026	$45.35	$9.90	$9.25	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BOILER MAKER BOILERMAKERS LOCAL 29 BOILERMAKERS LOCAL 29	1/1/2024	$48.12	$7.07	$14.60	$6.00	$0.00	$75.79

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
2	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
3	70.00	$33.68	$7.07	$10.03	$4.20	$0.00	$54.98
4	75.00	$36.09	$7.07	$10.74	$4.50	$0.00	$58.40
5	80.00	$38.50	$7.07	$11.45	$4.80	$0.00	$61.82
6	85.00	$40.90	$7.07	$12.18	$5.10	$0.00	$65.25
7	90.00	$43.31	$7.07	$12.88	$5.40	$0.00	$68.66
8	95.00	$45.71	$7.07	$13.62	$5.70	$0.00	$72.10

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (WORCESTER)	2/1/2025	$63.66	$11.49	$15.57	$7.33	$0.00	$98.05
	8/1/2025	$65.81	$11.49	$15.57	$7.33	$0.00	$100.20
	2/1/2026	$67.16	$11.49	$15.57	$7.33	$0.00	$101.55
	8/1/2026	$69.36	$11.49	$15.57	$7.33	$0.00	$103.75
	2/1/2027	$70.76	$11.49	$15.57	$7.33	$0.00	$105.15

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.83	$11.49	$15.57	$7.33	$0.00	$66.22
2	60.00	$38.20	$11.49	$15.57	$7.33	$0.00	$72.59
3	70.00	$44.56	$11.49	$15.57	$7.33	$0.00	$78.95
4	80.00	$50.93	$11.49	$15.57	$7.33	$0.00	$85.32
5	90.00	$57.29	$11.49	$15.57	$7.33	$0.00	$91.68

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.91	$11.49	$15.57	$7.33	$0.00	$67.30
2	60.00	$39.49	$11.49	$15.57	$7.33	$0.00	$73.88
3	70.00	$46.07	$11.49	$15.57	$7.33	$0.00	$80.46
4	80.00	$52.65	$11.49	$15.57	$7.33	$0.00	$87.04
5	90.00	$59.23	$11.49	$15.57	$7.33	$0.00	$93.62

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BULLDOZER/GRADER/SCRAPER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CAISSON & UNDERPINNING BOTTOM MAN	6/1/2025	$48.85	$9.90	$9.25	$9.80	$0.00	$77.80
LABORERS	12/1/2025	$50.35	$9.90	$9.25	$9.80	$0.00	$79.30
LABORERS - FOUNDATION AND MARINE	6/1/2026	$51.90	$9.90	$9.25	$9.80	$0.00	$80.85
	12/1/2026	$53.40	$9.90	$9.25	$9.80	$0.00	$82.35
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
LABORERS	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN	6/1/2025	$48.03	$9.90	$9.25	$9.80	$0.00	$76.98
LABORERS	12/1/2025	$49.53	$9.90	$9.25	$9.80	$0.00	$78.48
LABORERS - FOUNDATION AND MARINE	6/1/2026	$51.08	$9.90	$9.25	$9.80	$0.00	$80.03
	12/1/2026	$52.58	$9.90	$9.25	$9.80	$0.00	$81.53
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
LABORERS	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
LABORERS - ZONE 2	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
CARPENTER	3/1/2025	$49.62	$9.83	$11.47	$8.50	$0.00	$79.42
CARPENTERS	9/1/2025	$50.87	$9.83	$11.47	$8.50	$0.00	$80.67
CARPENTERS -ZONE 2 (Eastern Massachusetts)	3/1/2026	$52.12	$9.83	$11.47	$8.50	$0.00	$81.92
	9/1/2026	$53.37	$9.83	$11.47	$8.50	$0.00	$83.17
	3/1/2027	$54.62	$9.83	$11.47	$8.50	$0.00	$84.42

Apprentice: CARPENTER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.33	$9.83	$0.00	$1.73	$0.00	$33.89
2	45.00	$22.33	$9.83	$0.00	$1.73	$0.00	$33.89
3	55.00	$27.29	$9.83	$0.00	$3.40	$0.00	$40.52
4	55.00	$27.29	$9.83	$0.00	$3.40	$0.00	$40.52
5	70.00	$34.73	$9.83	$11.41	$5.10	$0.00	$61.07
6	70.00	$34.73	$9.83	$11.41	$5.10	$0.00	$61.07
7	80.00	$39.70	$9.83	$11.44	$6.80	$0.00	$67.77
8	80.00	$39.70	$9.83	$11.44	$6.80	$0.00	$67.77

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CARPENTER WOOD FRAME	10/1/2024	$26.65	$7.02	$3.80	$1.00	$0.00	$38.47
CARPENTERS	10/1/2025	$27.75	$7.02	$3.80	$1.00	$0.00	$39.57
CARPENTERS-ZONE 3 (Wood Frame)	10/1/2026	$28.85	$7.02	$3.80	$1.00	$0.00	$40.67

All Aspects of New Wood Frame Work

Apprentice: CARPENTER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.89	$9.83	$0.00	$1.73	$0.00	$34.45
2	45.00	$22.89	$9.83	$0.00	$1.73	$0.00	$34.45
3	55.00	$27.98	$9.83	$0.00	$3.40	$0.00	$41.21
4	55.00	$27.98	$9.83	$0.00	$3.40	$0.00	$41.21
5	70.00	$35.61	$9.83	$11.41	$5.10	$0.00	$61.95
6	70.00	$35.61	$9.83	$11.41	$5.10	$0.00	$61.95
7	80.00	$40.70	$9.83	$11.44	$6.80	$0.00	$68.77
8	80.00	$40.70	$9.83	$11.44	$6.80	$0.00	$68.77

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01
2	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01
3	65.00	$17.32	$7.02	$0.00	$1.00	$0.00	$25.34
4	70.00	$18.66	$7.02	$0.00	$1.00	$0.00	$26.68
5	75.00	$19.99	$7.02	$3.80	$1.00	$0.00	$31.81
6	80.00	$21.32	$7.02	$3.80	$1.00	$0.00	$33.14
7	85.00	$22.65	$7.02	$3.80	$1.00	$0.00	$34.47
8	90.00	$23.99	$7.02	$3.80	$1.00	$0.00	$35.81

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
2	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
3	65.00	$18.04	$7.02	$0.00	$1.00	$0.00	$26.06
4	70.00	$19.43	$7.02	$0.00	$1.00	$0.00	$27.45
5	75.00	$20.81	$7.02	$3.80	$1.00	$0.00	$32.63
6	80.00	$22.20	$7.02	$3.80	$1.00	$0.00	$34.02
7	85.00	$23.59	$7.02	$3.80	$1.00	$0.00	$35.41
8	90.00	$24.98	$7.02	$3.80	$1.00	$0.00	$36.80

CEMENT MASONRY/PLASTERING	7/1/2024	$49.19	$13.35	$16.43	$7.78	$1.80	$88.55

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (WORCESTER)							

Apprentice: CEMENT MASONRY/PLASTERING

Effective Date: 7/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.60	$13.35	$16.43	$0.00	$0.00	$54.38
2	60.00	$29.51	$13.35	$16.43	$2.78	$1.80	$63.87
3	65.00	$31.97	$13.35	$16.43	$3.78	$1.80	$67.33
4	70.00	$34.43	$13.35	$16.43	$4.78	$1.80	$70.79
5	75.00	$36.89	$13.35	$16.43	$5.78	$1.80	$74.25
6	80.00	$39.35	$13.35	$16.43	$6.78	$1.80	$77.71
7	90.00	$44.27	$13.35	$16.43	$7.78	$1.80	$83.63

CHAIN SAW OPERATOR LABORERS LABORERS - ZONE 2	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$59.51	$15.55	$13.25	$3.25	$0.00	$91.56
	12/1/2025	$60.98	$15.55	$13.25	$3.25	$0.00	$93.03
	6/1/2026	$62.31	$15.55	$13.25	$3.25	$0.00	$94.36
	12/1/2026	$63.79	$15.55	$13.25	$3.25	$0.00	$95.84
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
COMPRESSOR OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$37.52	$15.55	$13.25	$3.25	$0.00	$69.57
	12/1/2025	$38.47	$15.55	$13.25	$3.25	$0.00	$70.52
	6/1/2026	$39.33	$15.55	$13.25	$3.25	$0.00	$71.38
	12/1/2026	$40.28	$15.55	$13.25	$3.25	$0.00	$72.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DELEADER (BRIDGE) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Apprentice: DELEADER (BRIDGE)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: DELEADER (BRIDGE)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DEMO: ADZEMAN LABORERS LABORERS - ZONE 2	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS LABORERS - ZONE 2	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BURNERS LABORERS LABORERS - ZONE 2	6/2/2025	$48.50	$9.90	$9.25	$9.65	$0.00	$77.30
	12/1/2025	$50.00	$9.90	$9.25	$9.65	$0.00	$78.80
	6/1/2026	$51.55	$9.90	$9.25	$9.65	$0.00	$80.35
	12/7/2026	$53.05	$9.90	$9.25	$9.65	$0.00	$81.85
	6/7/2027	$54.65	$9.90	$9.25	$9.65	$0.00	$83.45
	12/6/2027	$56.25	$9.90	$9.25	$9.65	$0.00	$85.05
	6/5/2028	$57.93	$9.90	$9.25	$9.65	$0.00	$86.73
	12/4/2028	$59.60	$9.90	$9.25	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: CONCRETE CUTTER/SAWYER LABORERS LABORERS - ZONE 2	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DEMO: JACKHAMMER OPERATOR	6/2/2025	$48.50	$9.90	$9.25	$9.65	$0.00	$77.30
LABORERS	12/1/2025	$50.00	$9.90	$9.25	$9.65	$0.00	$78.80
LABORERS - ZONE 2	6/1/2026	$51.55	$9.90	$9.25	$9.65	$0.00	$80.35
	12/7/2026	$53.05	$9.90	$9.25	$9.65	$0.00	$81.85
	6/7/2027	$54.65	$9.90	$9.25	$9.65	$0.00	$83.45
	12/6/2027	$56.25	$9.90	$9.25	$9.65	$0.00	$85.05
	6/5/2028	$57.93	$9.90	$9.25	$9.65	$0.00	$86.73
	12/4/2028	$59.60	$9.90	$9.25	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: WRECKING LABORER	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
LABORERS	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
LABORERS - ZONE 2	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DIRECTIONAL DRILL MACHINE OPERATOR	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DIVER	8/1/2024	$78.11	$10.08	$11.62	$12.67	$0.00	$112.48
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 2)							
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A $69.83, 3A $91.79,4A $102.14 Total Rate							
DIVER TENDER	8/1/2024	$51.97	$10.08	$11.62	$12.67	$0.00	$86.34
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 2)							
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A $54.20, 3A $73.93,4A $82.05 Total Rate							
DIVER TENDER (EFFLUENT)	8/1/2024	$83.69	$10.08	$11.62	$12.67	$0.00	$118.06
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 2)							
For apprentice rates see "Apprentice- PILE DRIVER"							
DIVER/SLURRY (EFFLUENT)	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 2)							
For apprentice rates see "Apprentice- PILE DRIVER"							
DRAWBRIDGE OPERATOR (Construction)	7/1/2020	$26.77	$6.67	$3.93	$0.00	$0.16	$37.53
DRAWBRIDGE - SEIU LOCAL 888							
DRAWBRIDGE - SEIU LOCAL 888							
ELECTRICIAN	9/1/2024	$47.05	$13.99	$14.04	$5.18	$0.00	$80.26
ELECTRICIANS LOCAL 96	9/7/2025	$48.16	$14.98	$14.30	$5.30	$0.00	$82.74
ELECTRICIANS LOCAL 96							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	9/6/2026	$49.38	$15.96	$14.57	$5.43	$0.00	$85.34

Apprentice: ELECTRICIAN

Effective Date: 9/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$18.82	$13.99	$0.56	$0.00	$0.00	$33.37
2	45.00	$21.17	$13.99	$0.64	$0.00	$0.00	$35.80
3	48.00	$22.58	$13.99	$13.31	$2.48	$0.00	$52.36
4	55.00	$25.88	$13.99	$13.41	$2.85	$0.00	$56.13
5	65.00	$30.58	$13.99	$13.55	$3.36	$0.00	$61.48
6	80.00	$37.64	$13.99	$13.76	$4.14	$0.00	$69.53

Apprentice: ELECTRICIAN

Effective Date: 9/7/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$19.26	$14.98	$0.58	$0.00	$0.00	$34.82
2	45.00	$21.67	$14.98	$0.65	$0.00	$0.00	$37.30
3	48.00	$23.12	$14.98	$13.55	$2.54	$0.00	$54.19
4	55.00	$26.49	$14.98	$13.65	$2.92	$0.00	$58.04
5	65.00	$31.30	$14.98	$13.80	$3.45	$0.00	$63.53
6	80.00	$38.53	$14.98	$14.02	$4.24	$0.00	$71.77

ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 41 ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2025	$62.83	$16.28	$10.96	$10.40	$0.00	$100.47
	1/1/2026	$63.68	$16.38	$11.06	$10.70	$0.00	$101.82
	1/1/2027	$64.53	$16.48	$11.16	$11.00	$0.00	$103.17

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.42	$16.28	$0.00	$0.00	$0.00	$47.70
2	55.00	$34.56	$16.28	$10.96	$10.40	$0.00	$72.20
3	65.00	$40.84	$16.28	$10.96	$10.40	$0.00	$78.48
4	70.00	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
5	80.00	$50.26	$16.28	$10.96	$10.40	$0.00	$87.90

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.84	$16.38	$0.00	$0.00	$0.00	$48.22
2	55.00	$35.02	$16.38	$11.06	$10.70	$0.00	$73.16

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: ELEVATOR CONSTRUCTOR							
Effective Date: 1/1/2026							
Step / Percent		**Apprentice Base Wage**					
3 / 65.00		$41.39	$16.38	$11.06	$10.70	$0.00	$79.53
4 / 70.00		$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
5 / 80.00		$50.94	$16.38	$11.06	$10.70	$0.00	$89.08
ELEVATOR CONSTRUCTOR HELPER	1/1/2025	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2026	$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2027	$45.17	$16.48	$11.16	$11.00	$0.00	$83.81
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)	6/1/2025	$40.59	$9.90	$9.25	$9.21	$0.00	$68.95
LABORERS	12/1/2025	$41.97	$9.90	$9.25	$9.21	$0.00	$70.33
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$43.41	$9.90	$9.25	$9.21	$0.00	$71.77
	12/1/2026	$44.85	$9.90	$9.25	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY	5/1/2025	$53.22	$15.30	$13.15	$3.25	$0.00	$84.92
OPERATING ENGINEERS LOCAL 4	11/1/2025	$54.51	$15.30	$13.15	$3.25	$0.00	$86.21
OPERATING ENGINEERS LOCAL 4	5/1/2026	$55.95	$15.30	$13.15	$3.25	$0.00	$87.65
	11/1/2026	$57.24	$15.30	$13.15	$3.25	$0.00	$88.94
	5/1/2027	$58.67	$15.30	$13.15	$3.25	$0.00	$90.37
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY	5/1/2025	$54.82	$15.30	$13.15	$3.25	$0.00	$86.52
OPERATING ENGINEERS LOCAL 4	11/1/2025	$56.12	$15.30	$13.15	$3.25	$0.00	$87.82
OPERATING ENGINEERS LOCAL 4	5/1/2026	$57.57	$15.30	$13.15	$3.25	$0.00	$89.27
	11/1/2026	$58.87	$15.30	$13.15	$3.25	$0.00	$90.57
	5/1/2027	$60.32	$15.30	$13.15	$3.25	$0.00	$92.02
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY	5/1/2025	$26.22	$15.30	$13.15	$3.25	$0.00	$57.92
OPERATING ENGINEERS LOCAL 4	11/1/2025	$26.98	$15.30	$13.15	$3.25	$0.00	$58.68
OPERATING ENGINEERS LOCAL 4	5/1/2026	$27.83	$15.30	$13.15	$3.25	$0.00	$59.53
	11/1/2026	$28.59	$15.30	$13.15	$3.25	$0.00	$60.29
	5/1/2027	$29.44	$15.30	$13.15	$3.25	$0.00	$61.14
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIRE ALARM INSTALLER	9/1/2024	$47.05	$13.99	$14.04	$5.18	$0.00	$80.26
ELECTRICIANS LOCAL 96	9/7/2025	$48.16	$14.98	$14.30	$5.30	$0.00	$82.74
ELECTRICIANS LOCAL 96	9/6/2026	$49.38	$15.96	$14.57	$5.43	$0.00	$85.34
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINT/COMMISSIONING	9/1/2024	$47.05	$13.99	$14.04	$5.18	$0.00	$80.26
ELECTRICIANS LOCAL 96	9/7/2025	$48.16	$14.98	$14.30	$5.30	$0.00	$82.74
ELECTRICIANS LOCAL 96	9/6/2026	$49.38	$15.96	$14.57	$5.43	$0.00	$85.34
For apprentice rates see "Apprentice- ELECTRICIAN"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
FIREMAN (ASST. ENGINEER) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$47.02	$15.55	$13.25	$3.25	$0.00	$79.07
	12/1/2025	$48.19	$15.55	$13.25	$3.25	$0.00	$80.24
	6/1/2026	$49.25	$15.55	$13.25	$3.25	$0.00	$81.30
	12/1/2026	$50.43	$15.55	$13.25	$3.25	$0.00	$82.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FLAGGER & SIGNALER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2025	$28.09	$9.90	$9.25	$9.21	$0.00	$56.45
	12/1/2025	$28.09	$9.90	$9.25	$9.21	$0.00	$56.45
	6/1/2026	$29.21	$9.90	$9.25	$9.21	$0.00	$57.57
	12/1/2026	$29.21	$9.90	$9.25	$9.21	$0.00	$57.57
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
FLOORCOVERER FLOORCOVERERS LOCAL 2168 FLOORCOVERERS LOCAL 2168 ZONE II	3/1/2024	$49.47	$8.83	$11.47	$8.80	$0.00	$78.57

Apprentice: FLOORCOVERER

Effective Date: 3/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.74	$8.83	$0.00	$1.76	$0.00	$35.33
2	55.00	$27.21	$8.83	$0.00	$1.76	$0.00	$37.80
3	60.00	$29.68	$8.83	$0.00	$3.52	$0.00	$42.03
4	65.00	$32.16	$8.83	$0.00	$3.52	$0.00	$44.51
5	70.00	$34.63	$8.83	$11.47	$5.28	$0.00	$60.21
6	75.00	$37.10	$8.83	$11.47	$5.28	$0.00	$62.68
7	80.00	$39.58	$8.83	$11.47	$7.04	$0.00	$66.92
8	85.00	$42.05	$8.83	$11.47	$7.04	$0.00	$69.39

FORK LIFT/CHERRY PICKER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$58.33	$15.55	$13.25	$3.25	$0.00	$90.38
	12/1/2025	$59.78	$15.55	$13.25	$3.25	$0.00	$91.83
	6/1/2026	$61.08	$15.55	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.53	$15.55	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GENERATOR/LIGHTING PLANT/HEATERS OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$37.52	$15.55	$13.25	$3.25	$0.00	$69.57
	12/1/2025	$38.47	$15.55	$13.25	$3.25	$0.00	$70.52
	6/1/2026	$39.33	$15.55	$13.25	$3.25	$0.00	$71.38
	12/1/2026	$40.28	$15.55	$13.25	$3.25	$0.00	$72.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) GLAZIERS LOCAL 35 GLAZIERS LOCAL 35 (ZONE 2)	1/1/2025	$47.96	$9.95	$11.85	$12.10	$0.00	$81.86

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.98	$9.95	$0.00	$0.00	$0.00	$33.93
2	55.00	$26.38	$9.95	$0.00	$6.66	$0.00	$42.99
3	60.00	$28.78	$9.95	$0.00	$7.26	$0.00	$45.99
4	65.00	$31.17	$9.95	$0.00	$7.87	$0.00	$48.99
5	70.00	$33.57	$9.95	$11.85	$8.47	$0.00	$63.84
6	75.00	$35.97	$9.95	$11.85	$9.08	$0.00	$66.85
7	80.00	$38.37	$9.95	$11.85	$9.68	$0.00	$69.85
8	90.00	$43.16	$9.95	$11.85	$10.89	$0.00	$75.85

HOISTING ENGINEER/CRANES/GRADALLS	6/1/2025	$58.33	$15.55	$13.25	$3.25	$0.00	$90.38
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.78	$15.55	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$61.08	$15.55	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.53	$15.55	$13.25	$3.25	$0.00	$94.58

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 6/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$32.08	$0.00	$0.00	$0.00	$0.00	$32.08
2	60.00	$35.00	$15.55	$13.25	$3.25	$0.00	$67.05
3	65.00	$37.91	$15.55	$13.25	$3.25	$0.00	$69.96
4	70.00	$40.83	$15.55	$13.25	$3.25	$0.00	$72.88
5	75.00	$43.75	$15.55	$13.25	$3.25	$0.00	$75.80
6	80.00	$46.66	$15.55	$13.25	$3.25	$0.00	$78.71
7	85.00	$49.58	$15.55	$13.25	$3.25	$0.00	$81.63
8	90.00	$52.50	$15.55	$13.25	$3.25	$0.00	$84.55

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$32.88	$0.00	$0.00	$0.00	$0.00	$32.88
2	60.00	$35.87	$15.55	$13.25	$3.25	$0.00	$67.92
3	65.00	$38.86	$15.55	$13.25	$3.25	$0.00	$70.91
4	70.00	$41.85	$15.55	$13.25	$3.25	$0.00	$73.90
5	75.00	$44.84	$15.55	$13.25	$3.25	$0.00	$76.89
6	80.00	$47.82	$15.55	$13.25	$3.25	$0.00	$79.87
7	85.00	$50.81	$15.55	$13.25	$3.25	$0.00	$82.86
8	90.00	$53.80	$15.55	$13.25	$3.25	$0.00	$85.85

HVAC (DUCTWORK)	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
SHEETMETAL WORKERS LOCAL 63							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
SHEETMETAL WORKERS LOCAL 63							
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (ELECTRICAL CONTROLS)	9/1/2024	$47.05	$13.99	$14.04	$5.18	$0.00	$80.26
ELECTRICIANS LOCAL 96	9/7/2025	$48.16	$14.98	$14.30	$5.30	$0.00	$82.74
ELECTRICIANS LOCAL 96	9/6/2026	$49.38	$15.96	$14.57	$5.43	$0.00	$85.34
For apprentice rates see "Apprentice- ELECTRICIAN"							
HVAC (TESTING AND BALANCING - AIR)	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
SHEETMETAL WORKERS LOCAL 63							
SHEETMETAL WORKERS LOCAL 63							
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (TESTING AND BALANCING -WATER)	3/1/2025	$55.00	$11.30	$9.71	$8.06	$0.00	$84.07
PLUMBERS LOCAL 4	9/1/2025	$56.40	$11.30	$9.71	$8.06	$0.00	$85.47
PLUMBERS LOCAL 4	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HVAC MECHANIC	3/1/2025	$55.00	$11.30	$9.71	$8.06	$0.00	$84.07
PLUMBERS LOCAL 4	9/1/2025	$56.40	$11.30	$9.71	$8.06	$0.00	$85.47
PLUMBERS LOCAL 4	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HYDRAULIC DRILLS	6/1/2025	$41.09	$9.90	$9.25	$9.11	$0.00	$69.35
LABORERS	12/1/2025	$42.47	$9.90	$9.25	$9.11	$0.00	$70.73
LABORERS - ZONE 2	6/1/2026	$43.91	$9.90	$9.25	$9.11	$0.00	$72.17
	12/1/2026	$45.35	$9.90	$9.25	$9.11	$0.00	$73.61
	6/1/2027	$46.80	$9.90	$9.25	$9.11	$0.00	$75.06
	12/1/2027	$48.25	$9.90	$9.25	$9.11	$0.00	$76.51
	6/1/2028	$49.75	$9.90	$9.25	$9.11	$0.00	$78.01
	12/1/2028	$51.25	$9.90	$9.25	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
HYDRAULIC DRILLS (HEAVY & HIGHWAY)	6/1/2025	$41.09	$9.90	$9.25	$9.21	$0.00	$69.45
LABORERS	12/1/2025	$42.47	$9.90	$9.25	$9.21	$0.00	$70.83
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$43.91	$9.90	$9.25	$9.21	$0.00	$72.27
	12/1/2026	$45.35	$9.90	$9.25	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
INSULATOR (PIPES & TANKS)	9/1/2024	$51.23	$14.75	$9.52	$10.09	$0.00	$85.59
HEAT & FROST INSULATORS LOCAL 6	9/1/2025	$54.31	$14.75	$9.52	$10.09	$0.00	$88.67
HEAT & FROST INSULATORS LOCAL 6 (WORCESTER)	9/1/2026	$57.38	$14.75	$9.52	$10.09	$0.00	$91.74

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$25.62	$14.75	$9.27	$5.05	$0.00	$54.69
2	60.00	$30.74	$14.75	$9.32	$6.05	$0.00	$60.86

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
3	70.00	$35.86	$14.75	$9.37	$7.06	$0.00	$67.04
4	80.00	$40.98	$14.75	$9.42	$8.07	$0.00	$73.22

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.16	$14.75	$9.27	$5.05	$0.00	$56.23
2	60.00	$32.59	$14.75	$9.32	$6.05	$0.00	$62.71
3	70.00	$38.02	$14.75	$9.37	$7.06	$0.00	$69.20
4	80.00	$43.45	$14.75	$9.42	$8.07	$0.00	$75.69

IRONWORKER/WELDER IRONWORKERS LOCAL 7 IRONWORKERS LOCAL 7 (WORCESTER AREA)	3/16/2024	$53.67	$8.35	$12.70	$14.00	$0.00	$88.72

Apprentice: IRONWORKER/WELDER

Effective Date: 3/16/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$32.20	$8.35	$12.70	$14.00	$0.00	$67.25
2	70.00	$37.57	$8.35	$12.70	$14.00	$0.00	$72.62
3	75.00	$40.25	$8.35	$12.70	$14.00	$0.00	$75.30
4	80.00	$42.94	$8.35	$12.70	$14.00	$0.00	$77.99
5	85.00	$45.62	$8.35	$12.70	$14.00	$0.00	$80.67
6	90.00	$48.30	$8.35	$12.70	$14.00	$0.00	$83.35

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS LABORERS - ZONE 2	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS LABORERS - ZONE 2	6/1/2025	$40.34	$9.90	$9.25	$9.11	$0.00	$68.60
	12/1/2025	$41.72	$9.90	$9.25	$9.11	$0.00	$69.98
	6/1/2026	$43.16	$9.90	$9.25	$9.11	$0.00	$71.42
	12/1/2026	$44.60	$9.90	$9.25	$9.11	$0.00	$72.86
	6/1/2027	$46.05	$9.90	$9.25	$9.11	$0.00	$74.31

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2027	$47.50	$9.90	$9.25	$9.11	$0.00	$75.76
	6/1/2028	$49.00	$9.90	$9.25	$9.11	$0.00	$77.26
	12/1/2028	$50.50	$9.90	$9.25	$9.11	$0.00	$78.76

Apprentice: LABORER

Effective Date: 6/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$24.20	$9.90	$9.25	$9.11	$0.00	$52.46
2	70.00	$28.24	$9.90	$9.25	$9.11	$0.00	$56.50
3	80.00	$32.27	$9.90	$9.25	$9.11	$0.00	$60.53
4	90.00	$36.31	$9.90	$9.25	$9.11	$0.00	$64.57

Apprentice: LABORER

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.03	$9.90	$9.25	$9.11	$0.00	$53.29
2	70.00	$29.20	$9.90	$9.25	$9.11	$0.00	$57.46
3	80.00	$33.38	$9.90	$9.25	$9.11	$0.00	$61.64
4	90.00	$37.55	$9.90	$9.25	$9.11	$0.00	$65.81

LABORER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2025	$40.34	$9.90	$9.25	$9.21	$0.00	$68.70
	12/1/2025	$41.72	$9.90	$9.25	$9.21	$0.00	$70.08
	6/1/2026	$43.16	$9.90	$9.25	$9.21	$0.00	$71.52
	12/1/2026	$44.60	$9.90	$9.25	$9.21	$0.00	$72.96

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 6/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$24.20	$9.90	$9.25	$9.21	$0.00	$52.56
2	70.00	$28.24	$9.90	$9.25	$9.21	$0.00	$56.60
3	80.00	$32.27	$9.90	$9.25	$9.21	$0.00	$60.63
4	90.00	$36.31	$9.90	$9.25	$9.21	$0.00	$64.67

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.03	$9.90	$9.25	$9.21	$0.00	$53.39
2	70.00	$29.20	$9.90	$9.25	$9.21	$0.00	$57.56
3	80.00	$33.38	$9.90	$9.25	$9.21	$0.00	$61.74
4	90.00	$37.55	$9.90	$9.25	$9.21	$0.00	$65.91

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER	6/1/2025	$40.34	$9.90	$9.25	$9.11	$0.00	$68.60
LABORERS	12/1/2025	$41.72	$9.90	$9.25	$9.11	$0.00	$69.98
LABORERS - ZONE 2	6/1/2026	$43.16	$9.90	$9.25	$9.11	$0.00	$71.42
	12/1/2026	$44.60	$9.90	$9.25	$9.11	$0.00	$72.86
	6/1/2027	$46.05	$9.90	$9.25	$9.11	$0.00	$74.31
	12/1/2027	$47.50	$9.90	$9.25	$9.11	$0.00	$75.76
	6/1/2028	$49.00	$9.90	$9.25	$9.11	$0.00	$77.26
	12/1/2028	$50.50	$9.90	$9.25	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: CEMENT FINISHER TENDER	6/1/2025	$40.34	$9.90	$9.25	$9.11	$0.00	$68.60
LABORERS	12/1/2025	$41.72	$9.90	$9.25	$9.11	$0.00	$69.98
LABORERS - ZONE 2	6/1/2026	$43.16	$9.90	$9.25	$9.11	$0.00	$71.42
	12/1/2026	$44.60	$9.90	$9.25	$9.11	$0.00	$72.86
	6/1/2027	$46.05	$9.90	$9.25	$9.11	$0.00	$74.31
	12/1/2027	$47.50	$9.90	$9.25	$9.11	$0.00	$75.76
	6/1/2028	$49.00	$9.90	$9.25	$9.11	$0.00	$77.26
	12/1/2028	$50.50	$9.90	$9.25	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER	6/2/2025	$40.43	$9.90	$9.25	$9.17	$0.00	$68.75
LABORERS	12/1/2025	$41.81	$9.90	$9.25	$9.17	$0.00	$70.13
LABORERS - ZONE 2	6/1/2026	$43.25	$9.90	$9.25	$9.17	$0.00	$71.57
	12/7/2026	$44.69	$9.90	$9.25	$9.17	$0.00	$73.01
	6/7/2027	$46.14	$9.90	$9.25	$9.17	$0.00	$74.46
	12/6/2027	$47.59	$9.90	$9.25	$9.17	$0.00	$75.91
	6/5/2028	$49.09	$9.90	$9.25	$9.17	$0.00	$77.41
	12/4/2028	$50.59	$9.90	$9.25	$9.17	$0.00	$78.91
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
LABORERS	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
LABORERS - ZONE 2	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER (HEAVY & HIGHWAY)	6/1/2025	$40.59	$9.90	$9.25	$9.21	$0.00	$68.95
LABORERS	12/1/2025	$41.97	$9.90	$9.25	$9.21	$0.00	$70.33
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$43.41	$9.90	$9.25	$9.21	$0.00	$71.77
	12/1/2026	$44.85	$9.90	$9.25	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
LABORER: MULTI-TRADE TENDER	6/1/2025	$40.34	$9.90	$9.25	$9.11	$0.00	$68.60
LABORERS	12/1/2025	$41.72	$9.90	$9.25	$9.11	$0.00	$69.98
LABORERS - ZONE 2	6/1/2026	$43.16	$9.90	$9.25	$9.11	$0.00	$71.42
	12/1/2026	$44.60	$9.90	$9.25	$9.11	$0.00	$72.86

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	6/1/2027	$46.05	$9.90	$9.25	$9.11	$0.00	$74.31
	12/1/2027	$47.50	$9.90	$9.25	$9.11	$0.00	$75.76
	6/1/2028	$49.00	$9.90	$9.25	$9.11	$0.00	$77.26
	12/1/2028	$50.50	$9.90	$9.25	$9.11	$0.00	$78.76

For apprentice rates see "Apprentice- LABORER"

LABORER: TREE REMOVER LABORERS LABORERS - ZONE 2	6/1/2025	$40.34	$9.90	$9.25	$9.11	$0.00	$68.60
	12/1/2025	$41.72	$9.90	$9.25	$9.11	$0.00	$69.98
	6/1/2026	$43.16	$9.90	$9.25	$9.11	$0.00	$71.42
	12/1/2026	$44.60	$9.90	$9.25	$9.11	$0.00	$72.86
	6/1/2027	$46.05	$9.90	$9.25	$9.11	$0.00	$74.31
	12/1/2027	$47.50	$9.90	$9.25	$9.11	$0.00	$75.76
	6/1/2028	$49.00	$9.90	$9.25	$9.11	$0.00	$77.26
	12/1/2028	$50.50	$9.90	$9.25	$9.11	$0.00	$78.76

This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"

LASER BEAM OPERATOR LABORERS LABORERS - ZONE 2	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01

For apprentice rates see "Apprentice- LABORER"

LASER BEAM OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2025	$40.59	$9.90	$9.25	$9.21	$0.00	$68.95
	12/1/2025	$41.97	$9.90	$9.25	$9.21	$0.00	$70.33
	6/1/2026	$43.41	$9.90	$9.25	$9.21	$0.00	$71.77
	12/1/2026	$44.85	$9.90	$9.25	$9.21	$0.00	$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

MARBLE & TILE FINISHERS BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 - MARBLE & TILE	2/1/2025	$50.36	$11.49	$15.57	$6.05	$0.00	$83.47
	8/1/2025	$52.08	$11.49	$15.57	$6.05	$0.00	$85.19
	2/1/2026	$53.16	$11.49	$15.57	$6.05	$0.00	$86.27
	8/1/2026	$54.92	$11.49	$15.57	$6.05	$0.00	$88.03
	2/1/2027	$56.04	$11.49	$15.57	$6.05	$0.00	$89.15

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$25.18	$11.49	$15.57	$6.05	$0.00	$58.29
2	60.00	$30.22	$11.49	$15.57	$6.05	$0.00	$63.33
3	70.00	$35.25	$11.49	$15.57	$6.05	$0.00	$68.36
4	80.00	$40.29	$11.49	$15.57	$6.05	$0.00	$73.40
5	90.00	$45.32	$11.49	$15.57	$6.05	$0.00	$78.43

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
MARBLE MASONS,TILELAYERS & TERRAZZO MECH BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 - MARBLE & TILE	2/1/2025	$65.82	$11.49	$15.57	$7.99	$0.00	$100.87
	8/1/2025	$67.97	$11.49	$15.57	$7.99	$0.00	$103.02
	2/1/2026	$69.32	$11.49	$15.57	$7.99	$0.00	$104.37
	8/1/2026	$71.52	$11.49	$15.57	$7.99	$0.00	$106.57
	2/1/2027	$72.92	$11.49	$15.57	$7.99	$0.00	$107.97

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.04	$11.49	$15.57	$6.05	$0.00	$59.15
2	60.00	$31.25	$11.49	$15.57	$6.05	$0.00	$64.36
3	70.00	$36.46	$11.49	$15.57	$6.05	$0.00	$69.57
4	80.00	$41.66	$11.49	$15.57	$6.05	$0.00	$74.77
5	90.00	$46.87	$11.49	$15.57	$6.05	$0.00	$79.98

Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.91	$11.49	$15.57	$7.99	$0.00	$67.96
2	60.00	$39.49	$11.49	$15.57	$7.99	$0.00	$74.54
3	70.00	$46.07	$11.49	$15.57	$7.99	$0.00	$81.12
4	80.00	$52.66	$11.49	$15.57	$7.99	$0.00	$87.71
5	90.00	$59.24	$11.49	$15.57	$7.99	$0.00	$94.29

Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.99	$11.49	$15.57	$7.99	$0.00	$69.04
2	60.00	$40.78	$11.49	$15.57	$7.99	$0.00	$75.83
3	70.00	$47.58	$11.49	$15.57	$7.99	$0.00	$82.63
4	80.00	$54.38	$11.49	$15.57	$7.99	$0.00	$89.43
5	90.00	$61.17	$11.49	$15.57	$7.99	$0.00	$96.22

MECH. SWEEPER OPERATOR (ON CONST. SITES) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANICS MAINTENANCE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MILLWRIGHT (Zone 3)	1/6/2025	$43.48	$10.08	$11.47	$9.75	$0.00	$74.78
MILLWRIGHTS LOCAL 1121 MILLWRIGHTS LOCAL 1121 - Zone 3	1/5/2026	$45.76	$10.08	$11.47	$9.75	$0.00	$77.06

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/6/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$23.91	$10.08	$0.00	$5.36	$0.00	$39.35
2	65.00	$28.26	$10.08	$0.00	$6.34	$0.00	$44.68
3	75.00	$32.61	$10.08	$11.47	$7.31	$0.00	$61.47
4	85.00	$36.96	$10.08	$11.47	$8.29	$0.00	$66.80

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/5/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$25.17	$10.08	$0.00	$5.36	$0.00	$40.61
2	65.00	$29.74	$10.08	$0.00	$6.34	$0.00	$46.16
3	75.00	$34.32	$10.08	$11.47	$7.31	$0.00	$63.18
4	85.00	$38.90	$10.08	$11.47	$8.29	$0.00	$68.74

MORTAR MIXER	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
LABORERS LABORERS - ZONE 2	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
OILER (OTHER THAN TRUCK CRANES,GRADALLS)	6/1/2025	$25.97	$15.30	$13.15	$3.25	$0.00	$57.67
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$26.63	$15.30	$13.15	$3.25	$0.00	$58.33
	6/1/2026	$27.22	$15.30	$13.15	$3.25	$0.00	$58.92
	12/1/2026	$27.89	$15.30	$13.15	$3.25	$0.00	$59.59
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OILER (TRUCK CRANES, GRADALLS)	6/1/2025	$31.80	$15.30	$13.15	$3.25	$0.00	$63.50
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$32.60	$15.30	$13.15	$3.25	$0.00	$64.30
	6/1/2026	$33.32	$15.30	$13.15	$3.25	$0.00	$65.02
	12/1/2026	$34.12	$15.30	$13.15	$3.25	$0.00	$65.82
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OTHER POWER DRIVEN EQUIPMENT - CLASS II	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

PAINTER (SPRAY OR SANDBLAST, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2025	$49.36	$9.95	$11.85	$12.10	$0.00	$83.26

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.68	$9.95	$0.00	$0.00	$0.00	$34.63
2	55.00	$27.15	$9.95	$0.00	$6.66	$0.00	$43.76
3	60.00	$29.62	$9.95	$0.00	$7.26	$0.00	$46.83
4	65.00	$32.08	$9.95	$0.00	$7.87	$0.00	$49.90
5	70.00	$34.55	$9.95	$11.85	$8.47	$0.00	$64.82
6	75.00	$37.02	$9.95	$11.85	$9.08	$0.00	$67.90
7	80.00	$39.49	$9.95	$11.85	$9.68	$0.00	$70.97
8	90.00	$44.42	$9.95	$11.85	$10.89	$0.00	$77.11

PAINTER (SPRAY OR SANDBLAST, REPAINT) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2025	$47.42	$9.95	$11.85	$12.10	$0.00	$81.32

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.71	$9.95	$0.00	$0.00	$0.00	$33.66
2	55.00	$26.08	$9.95	$0.00	$6.66	$0.00	$42.69
3	60.00	$28.45	$9.95	$0.00	$7.26	$0.00	$45.66
4	65.00	$30.82	$9.95	$0.00	$7.87	$0.00	$48.64
5	70.00	$33.19	$9.95	$11.85	$8.47	$0.00	$63.46
6	75.00	$35.57	$9.95	$11.85	$9.08	$0.00	$66.45
7	80.00	$37.94	$9.95	$11.85	$9.68	$0.00	$69.42
8	90.00	$42.68	$9.95	$11.85	$10.89	$0.00	$75.37

PAINTER / TAPER (BRUSH, NEW) * 1/1/2025 $47.96 $9.95 $11.85 $12.10 $0.00 $81.86
* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used.
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 2

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.98	$9.95	$0.00	$0.00	$0.00	$33.93
2	55.00	$26.38	$9.95	$0.00	$6.66	$0.00	$42.99
3	60.00	$28.78	$9.95	$0.00	$7.26	$0.00	$45.99
4	65.00	$31.17	$9.95	$0.00	$7.87	$0.00	$48.99
5	70.00	$33.57	$9.95	$11.85	$8.47	$0.00	$63.84
6	75.00	$35.97	$9.95	$11.85	$9.08	$0.00	$66.85
7	80.00	$38.37	$9.95	$11.85	$9.68	$0.00	$69.85
8	90.00	$43.16	$9.95	$11.85	$10.89	$0.00	$75.85

PAINTER / TAPER (BRUSH, REPAINT) 1/1/2025 $46.02 $9.95 $11.85 $12.10 $0.00 $79.92
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 2

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.01	$9.95	$0.00	$0.00	$0.00	$32.96
2	55.00	$25.31	$9.95	$0.00	$6.66	$0.00	$41.92
3	60.00	$27.61	$9.95	$0.00	$7.26	$0.00	$44.82
4	65.00	$29.91	$9.95	$0.00	$7.87	$0.00	$47.73
5	70.00	$32.21	$9.95	$11.85	$8.47	$0.00	$62.48
6	75.00	$34.52	$9.95	$11.85	$9.08	$0.00	$65.40

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: PAINTER / TAPER (BRUSH, REPAINT)							
Effective Date: 1/1/2025							
Step / Percent		**Apprentice Base Wage**					
7 / 80.00		$36.82	$9.95	$11.85	$9.68	$0.00	$68.30
8 / 90.00		$41.42	$9.95	$11.85	$10.89	$0.00	$74.11
PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2025	$40.34	$9.90	$9.25	$9.21	$0.00	$68.70
	12/1/2025	$41.72	$9.90	$9.25	$9.21	$0.00	$70.08
	6/1/2026	$43.16	$9.90	$9.25	$9.21	$0.00	$71.52
	12/1/2026	$44.60	$9.90	$9.25	$9.21	$0.00	$72.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$40.78	$15.57	$20.17	$0.00	$0.00	$76.52
	12/1/2025	$40.78	$15.57	$21.78	$0.00	$0.00	$78.13
	1/1/2026	$40.78	$16.17	$21.78	$0.00	$0.00	$78.73
	6/1/2026	$41.78	$16.17	$21.78	$0.00	$0.00	$79.73
	12/1/2026	$41.78	$16.17	$23.52	$0.00	$0.00	$81.47
	1/1/2027	$41.78	$16.77	$23.52	$0.00	$0.00	$82.07
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 2)	8/1/2024	$51.97	$10.08	$11.62	$12.67	$0.00	$86.34
For apprentice rates see "Apprentice- PILE DRIVER"							
PILE DRIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 2)	8/1/2024	$51.97	$10.08	$11.62	$12.67	$0.00	$86.34
Apprentice: PILE DRIVER							
Effective Date: 8/1/2024							
Step / Percent		**Apprentice Base Wage**					
1 / 45.00		$23.39	$10.08	$0.00	$2.53	$0.00	$36.00
2 / 55.00		$28.58	$10.08	$0.00	$5.07	$0.00	$43.73
3 / 70.00		$36.38	$10.08	$11.62	$7.60	$0.00	$65.68
4 / 80.00		$41.58	$10.08	$11.62	$10.14	$0.00	$73.42
PIPELAYER LABORERS LABORERS - ZONE 2	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PIPELAYER (HEAVY & HIGHWAY)	6/1/2025	$40.59	$9.90	$9.25	$9.21	$0.00	$68.95
LABORERS	12/1/2025	$41.97	$9.90	$9.25	$9.21	$0.00	$70.33
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$43.41	$9.90	$9.25	$9.21	$0.00	$71.77
	12/1/2026	$44.85	$9.90	$9.25	$9.21	$0.00	$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

PLUMBER & PIPEFITTER	3/1/2025	$55.00	$11.30	$9.71	$8.06	$0.00	$84.07
PLUMBERS LOCAL 4	9/1/2025	$56.40	$11.30	$9.71	$8.06	$0.00	$85.47
PLUMBERS LOCAL 4	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$22.00	$11.30	$0.00	$0.00	$0.00	$33.30
2	50.00	$27.50	$11.30	$0.00	$0.00	$0.00	$38.80
3	60.00	$33.00	$11.30	$0.00	$0.00	$0.00	$44.30
4	70.00	$38.50	$11.30	$0.00	$8.06	$0.00	$57.86
5	80.00	$44.00	$11.30	$0.00	$8.06	$0.00	$63.36

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$22.56	$11.30	$0.00	$0.00	$0.00	$33.86
2	50.00	$28.20	$11.30	$0.00	$0.00	$0.00	$39.50
3	60.00	$33.84	$11.30	$0.00	$0.00	$0.00	$45.14
4	70.00	$39.48	$11.30	$0.00	$8.06	$0.00	$58.84
5	80.00	$45.12	$11.30	$0.00	$8.06	$0.00	$64.48

PNEUMATIC CONTROLS (TEMP.)	3/1/2025	$55.00	$11.30	$9.71	$8.06	$0.00	$84.07
PLUMBERS LOCAL 4	9/1/2025	$56.40	$11.30	$9.71	$8.06	$0.00	$85.47
PLUMBERS LOCAL 4	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

PNEUMATIC DRILL/TOOL OPERATOR	6/1/2025	$41.09	$9.90	$9.25	$8.29	$0.00	$68.53
LABORERS	12/1/2025	$42.47	$9.90	$9.25	$8.29	$0.00	$69.91
LABORERS - ZONE 2	6/1/2026	$43.91	$9.90	$9.25	$8.29	$0.00	$71.35
	12/1/2026	$45.35	$9.90	$9.25	$8.29	$0.00	$72.79
	6/1/2027	$46.80	$9.90	$9.25	$8.29	$0.00	$74.24
	12/1/2027	$48.25	$9.90	$9.25	$8.29	$0.00	$75.69
	6/1/2028	$49.75	$9.90	$9.25	$8.29	$0.00	$77.19
	12/1/2028	$51.25	$9.90	$9.25	$8.29	$0.00	$78.69

For apprentice rates see "Apprentice- LABORER"

PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY)	6/1/2025	$40.59	$9.90	$9.25	$9.21	$0.00	$68.95
LABORERS	12/1/2025	$41.97	$9.90	$9.25	$9.21	$0.00	$70.33

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$43.41	$9.90	$9.25	$9.21	$0.00	$71.77
	12/1/2026	$44.85	$9.90	$9.25	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
POWDERMAN & BLASTER	6/1/2025	$41.34	$9.90	$9.25	$9.11	$0.00	$69.60
LABORERS	12/1/2025	$42.72	$9.90	$9.25	$9.11	$0.00	$70.98
LABORERS - ZONE 2	6/1/2026	$44.16	$9.90	$9.25	$9.11	$0.00	$72.42
	12/1/2026	$45.60	$9.90	$9.25	$9.11	$0.00	$73.86
	6/1/2027	$47.05	$9.90	$9.25	$9.11	$0.00	$75.31
	12/1/2027	$48.50	$9.90	$9.25	$9.11	$0.00	$76.76
	6/1/2028	$50.00	$9.90	$9.25	$9.11	$0.00	$78.26
	12/1/2028	$51.50	$9.90	$9.25	$9.11	$0.00	$79.76
For apprentice rates see "Apprentice- LABORER"							
POWDERMAN & BLASTER (HEAVY & HIGHWAY)	6/1/2025	$41.34	$9.65	$9.25	$9.21	$0.00	$69.45
LABORERS	12/1/2025	$42.72	$9.65	$9.25	$9.21	$0.00	$70.83
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$44.16	$9.65	$9.25	$9.21	$0.00	$72.27
	12/1/2026	$45.60	$9.65	$9.25	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
POWER SHOVEL/DERRICK/TRENCHING MACHINE	6/1/2025	$58.33	$15.55	$13.25	$3.25	$0.00	$90.38
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.78	$15.55	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$61.08	$15.55	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.53	$15.55	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (CONCRETE)	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (DEWATERING, OTHER)	6/1/2025	$37.52	$15.55	$13.25	$3.25	$0.00	$69.57
OPERATING ENGINEERS LOCAL 4	12/1/2025	$38.47	$15.55	$13.25	$3.25	$0.00	$70.52
OPERATING ENGINEERS LOCAL 4	6/1/2026	$39.33	$15.55	$13.25	$3.25	$0.00	$71.38
	12/1/2026	$40.28	$15.55	$13.25	$3.25	$0.00	$72.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
READY-MIX CONCRETE DRIVER	1/1/2025	$27.60	$11.26	$6.15	$0.00	$0.00	$45.01
TEAMSTERS 170							
TEAMSTERS 170 - Dauphinais (Bellingham)							
RECLAIMERS	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
RIDE-ON MOTORIZED BUGGY OPERATOR	6/1/2025	$40.59	$9.90	$9.25	$9.11	$0.00	$68.85
LABORERS	12/1/2025	$41.97	$9.90	$9.25	$9.11	$0.00	$70.23
LABORERS - ZONE 2	6/1/2026	$43.41	$9.90	$9.25	$9.11	$0.00	$71.67

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2026	$44.85	$9.90	$9.25	$9.11	$0.00	$73.11
	6/1/2027	$46.30	$9.90	$9.25	$9.11	$0.00	$74.56
	12/1/2027	$47.75	$9.90	$9.25	$9.11	$0.00	$76.01
	6/1/2028	$49.25	$9.90	$9.25	$9.11	$0.00	$77.51
	12/1/2028	$50.75	$9.90	$9.25	$9.11	$0.00	$79.01

For apprentice rates see "Apprentice- LABORER"

ROLLER/SPREADER/MULCHING MACHINE	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)	2/1/2025	$52.03	$13.28	$12.67	$9.03	$0.00	$87.01
ROOFERS LOCAL 33	8/1/2025	$53.53	$13.28	$12.67	$9.03	$0.00	$88.51
ROOFERS LOCAL 33	2/1/2026	$54.78	$13.28	$12.67	$9.03	$0.00	$89.76

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.02	$13.28	$6.52	$9.03	$0.00	$54.85
2	60.00	$31.22	$13.28	$12.67	$9.03	$0.00	$66.20
3	65.00	$33.82	$13.28	$12.67	$9.03	$0.00	$68.80
4	75.00	$39.02	$13.28	$12.67	$9.03	$0.00	$74.00
5	85.00	$44.23	$13.28	$12.67	$9.03	$0.00	$79.21

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.77	$13.28	$6.52	$9.03	$0.00	$55.60
2	60.00	$32.12	$13.28	$12.67	$9.03	$0.00	$67.10
3	65.00	$34.79	$13.28	$12.67	$9.03	$0.00	$69.77
4	75.00	$40.15	$13.28	$12.67	$9.03	$0.00	$75.13
5	85.00	$45.50	$13.28	$12.67	$9.03	$0.00	$80.48

ROOFER SLATE / TILE / PRECAST CONCRETE	2/1/2025	$52.28	$13.28	$12.67	$9.03	$0.00	$87.26
ROOFERS LOCAL 33	8/1/2025	$53.78	$13.28	$12.67	$9.03	$0.00	$88.76
ROOFERS LOCAL 33	2/1/2026	$55.03	$13.28	$12.67	$9.03	$0.00	$90.01

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
SHEETMETAL WORKERS LOCAL 63							
SHEETMETAL WORKERS LOCAL 63							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: SHEETMETAL WORKER							
Effective Date: 1/1/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 45.00		$19.00	$5.49	$4.86	$0.00	$0.85	$30.20
2 / 50.00		$21.12	$6.10	$5.40	$0.00	$0.94	$33.56
3 / 55.00		$23.23	$6.71	$9.71	$0.00	$1.15	$40.80
4 / 60.00		$25.34	$7.32	$9.71	$0.00	$1.23	$43.60
5 / 65.00		$27.45	$7.93	$9.71	$0.00	$1.31	$46.40
6 / 70.00		$29.56	$8.54	$9.71	$0.00	$1.39	$49.20
7 / 75.00		$31.67	$9.15	$9.71	$0.00	$1.47	$52.00
8 / 80.00		$33.78	$9.76	$9.71	$7.95	$1.78	$62.98
9 / 85.00		$35.90	$10.37	$9.71	$7.95	$1.86	$65.79
10 / 90.00		$38.01	$10.98	$9.71	$7.95	$1.94	$68.59
SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.53	$15.57	$20.17	$0.00	$0.00	$77.27
	12/1/2025	$41.53	$15.57	$21.78	$0.00	$0.00	$78.88
	1/1/2026	$41.53	$16.17	$21.78	$0.00	$0.00	$79.48
	6/1/2026	$42.53	$16.17	$21.78	$0.00	$0.00	$80.48
	12/1/2026	$42.53	$16.17	$23.52	$0.00	$0.00	$82.22
	1/1/2027	$42.53	$16.77	$23.52	$0.00	$0.00	$82.82
SPRINKLER FITTER SPRINKLER FITTERS LOCAL 550 SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1	3/1/2025	$72.14	$11.51	$7.30	$16.50	$0.00	$107.45
Apprentice: SPRINKLER FITTER							
Effective Date: 3/1/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 35.00		$25.25	$11.51	$13.07	$0.00	$0.00	$49.83
2 / 40.00		$28.86	$11.51	$13.90	$0.00	$0.00	$54.27
3 / 45.00		$32.46	$11.51	$14.73	$0.00	$0.00	$58.70
4 / 50.00		$36.07	$11.51	$15.55	$0.00	$0.00	$63.13
5 / 55.00		$39.68	$11.51	$16.37	$0.00	$0.00	$67.56
6 / 60.00		$43.28	$11.51	$17.20	$0.00	$0.00	$71.99
7 / 65.00		$46.89	$11.51	$18.03	$0.00	$0.00	$76.43
8 / 70.00		$50.50	$11.51	$18.85	$0.00	$0.00	$80.86
9 / 75.00		$54.11	$11.51	$19.67	$0.00	$0.00	$85.29
10 / 80.00		$57.71	$11.51	$20.50	$0.00	$0.00	$89.72

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
STEAM BOILER OPERATOR	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TERRAZZO FINISHERS	2/1/2025	$64.74	$11.49	$15.57	$8.02	$0.00	$99.82
BRICKLAYERS LOCAL 3	8/1/2025	$66.89	$11.49	$15.57	$8.02	$0.00	$101.97
BRICKLAYERS LOCAL 3 - MARBLE & TILE	2/1/2026	$68.24	$11.49	$15.57	$8.02	$0.00	$103.32
	8/1/2026	$70.44	$11.49	$15.57	$8.02	$0.00	$105.52
	2/1/2027	$71.84	$11.49	$15.57	$8.02	$0.00	$106.92

Apprentice: TERRAZZO FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.37	$11.49	$15.57	$8.02	$0.00	$67.45
2	60.00	$38.84	$11.49	$15.57	$8.02	$0.00	$73.92
3	70.00	$45.32	$11.49	$15.57	$8.02	$0.00	$80.40
4	80.00	$51.79	$11.49	$15.57	$8.02	$0.00	$86.87
5	90.00	$58.27	$11.49	$15.57	$8.02	$0.00	$93.35

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.45	$11.49	$15.57	$8.02	$0.00	$68.53
2	60.00	$40.13	$11.49	$15.57	$8.02	$0.00	$75.21
3	70.00	$46.82	$11.49	$15.57	$8.02	$0.00	$81.90
4	80.00	$53.51	$11.49	$15.57	$8.02	$0.00	$88.59
5	90.00	$60.20	$11.49	$15.57	$8.02	$0.00	$95.28

TEST BORING DRILLER	6/1/2025	$51.70	$9.90	$9.25	$9.80	$0.00	$80.65
LABORERS	12/1/2025	$53.20	$9.90	$9.25	$9.80	$0.00	$82.15
LABORERS - FOUNDATION AND MARINE	6/1/2026	$54.75	$9.90	$9.25	$9.80	$0.00	$83.70
	12/1/2026	$56.25	$9.90	$9.25	$9.80	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER	6/1/2025	$47.82	$9.90	$9.25	$9.80	$0.00	$76.77
LABORERS	12/1/2025	$49.32	$9.90	$9.25	$9.80	$0.00	$78.27
LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.87	$9.90	$9.25	$9.80	$0.00	$79.82

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2026	$52.37	$9.90	$9.25	$9.80	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
LABORERS	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS/PORTABLE STEAM GENERATORS	6/1/2025	$57.68	$15.55	$13.25	$3.25	$0.00	$89.73
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.12	$15.55	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.40	$15.55	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.84	$15.55	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT	6/1/2025	$41.82	$15.57	$20.17	$0.00	$0.00	$77.56
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2025	$41.82	$15.57	$21.78	$0.00	$0.00	$79.17
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2026	$41.82	$16.17	$21.78	$0.00	$0.00	$79.77
	6/1/2026	$42.82	$16.17	$21.78	$0.00	$0.00	$80.77
	12/1/2026	$42.82	$16.17	$23.52	$0.00	$0.00	$82.51
	1/1/2027	$42.82	$16.77	$23.52	$0.00	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR	6/1/2025	$59.93	$9.90	$9.25	$10.25	$0.00	$89.33
LABORERS	12/1/2025	$61.43	$9.90	$9.25	$10.25	$0.00	$90.83
LABORERS (COMPRESSED AIR)	6/1/2026	$62.98	$9.90	$9.25	$10.25	$0.00	$92.38
	12/1/2026	$64.48	$9.90	$9.25	$10.25	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	6/1/2025	$61.93	$9.90	$9.25	$10.25	$0.00	$91.33
LABORERS	12/1/2025	$63.43	$9.90	$9.25	$10.25	$0.00	$92.83
LABORERS (COMPRESSED AIR)	6/1/2026	$64.98	$9.90	$9.25	$10.25	$0.00	$94.38
	12/1/2026	$66.48	$9.90	$9.25	$10.25	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR	6/1/2025	$52.00	$9.90	$9.25	$10.25	$0.00	$81.40
LABORERS	12/1/2025	$53.50	$9.90	$9.25	$10.25	$0.00	$82.90
LABORERS (FREE AIR TUNNEL)	6/1/2026	$55.05	$9.90	$9.25	$10.25	$0.00	$84.45
	12/1/2026	$56.55	$9.90	$9.25	$10.25	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE)	6/1/2025	$54.00	$9.90	$9.25	$10.25	$0.00	$83.40
LABORERS	12/1/2025	$55.50	$9.90	$9.25	$10.25	$0.00	$84.90
LABORERS (FREE AIR TUNNEL)	6/1/2026	$57.05	$9.90	$9.25	$10.25	$0.00	$86.45
	12/1/2026	$58.55	$9.90	$9.25	$10.25	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
VOICE-DATA-VIDEO TECHNICIAN	9/1/2024	$35.29	$13.99	$13.69	$3.88	$0.00	$66.85
ELECTRICIANS LOCAL 96	9/7/2025	$36.12	$14.98	$13.94	$3.97	$0.00	$69.01
ELECTRICIANS LOCAL 96	9/6/2026	$37.04	$15.96	$14.20	$4.07	$0.00	$71.27

Apprentice: VOICE-DATA-VIDEO TECHNICIAN

Effective Date: 9/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$17.65	$13.99	$0.53	$3.88	$0.00	$36.05
2	55.00	$19.41	$13.99	$0.58	$3.88	$0.00	$37.86
3	60.00	$21.17	$13.99	$13.27	$3.88	$0.00	$52.31
4	65.00	$22.94	$13.99	$13.32	$3.88	$0.00	$54.13
5	70.00	$24.70	$13.99	$13.37	$3.88	$0.00	$55.94
6	75.00	$26.47	$13.99	$13.42	$3.88	$0.00	$57.76
7	80.00	$28.23	$13.99	$13.48	$3.88	$0.00	$59.58
8	85.00	$30.00	$13.99	$13.53	$3.88	$0.00	$61.40

Apprentice: VOICE-DATA-VIDEO TECHNICIAN

Effective Date: 9/7/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$18.06	$14.98	$0.54	$3.97	$0.00	$37.55
2	55.00	$19.87	$14.98	$0.60	$3.97	$0.00	$39.42
3	60.00	$21.67	$14.98	$13.51	$3.97	$0.00	$54.13
4	65.00	$23.48	$14.98	$13.56	$3.97	$0.00	$55.99
5	70.00	$25.28	$14.98	$13.62	$3.97	$0.00	$57.85
6	75.00	$27.09	$14.98	$13.67	$3.97	$0.00	$59.71
7	80.00	$28.90	$14.98	$13.73	$3.97	$0.00	$61.58
8	85.00	$30.70	$14.98	$13.78	$3.97	$0.00	$63.43

WAGON DRILL OPERATOR	6/1/2025	$42.00	$9.65	$9.00	$8.70	$0.00	$69.35
LABORERS	12/1/2025	$43.38	$9.65	$9.00	$8.70	$0.00	$70.73
LABORERS - ZONE 2	6/1/2026	$44.82	$9.65	$9.00	$8.70	$0.00	$72.17
	12/1/2026	$46.26	$9.65	$9.00	$8.70	$0.00	$73.61
	6/1/2027	$47.71	$9.65	$9.00	$8.70	$0.00	$75.06
	12/1/2027	$49.16	$9.65	$9.00	$8.70	$0.00	$76.51
	6/1/2028	$50.66	$9.65	$9.00	$8.70	$0.00	$78.01
	12/1/2028	$52.16	$9.65	$9.00	$8.70	$0.00	$79.51

For apprentice rates see "Apprentice- LABORER"

WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	6/1/2025	$40.59	$9.90	$9.25	$9.21	$0.00	$68.95
LABORERS	12/1/2025	$41.97	$9.90	$9.25	$9.21	$0.00	$70.33
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$43.41	$9.90	$9.25	$9.21	$0.00	$71.77
	12/1/2026	$44.85	$9.90	$9.25	$9.21	$0.00	$73.21

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
WASTE WATER PUMP OPERATOR	6/1/2025	$58.33	$15.55	$13.25	$3.25	$0.00	$90.38
OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.78	$15.55	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$61.08	$15.55	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.53	$15.55	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
WATER METER INSTALLER	3/1/2025	$55.00	$11.30	$9.71	$8.06	$0.00	$84.07
PLUMBERS LOCAL 4	9/1/2025	$56.40	$11.30	$9.71	$8.06	$0.00	$85.47
PLUMBERS LOCAL 4	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"							

Outside Electrical

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CABLE TECHNICIAN (Power Zone) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 For apprentice rates see "Apprentice- LINEMAN"	8/30/2020	$29.67	$9.25	$0.89	$1.00	$0.00	$40.81
CABLEMAN (Underground Ducts & Cables) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 For apprentice rates see "Apprentice- LINEMAN"	8/30/2020	$42.03	$9.25	$1.26	$9.01	$0.00	$61.55
DRIVER / GROUNDMAN CDL OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 For apprentice rates see "Apprentice- LINEMAN"	8/30/2020	$34.62	$9.25	$1.04	$9.03	$0.00	$53.94
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 For apprentice rates see "Apprentice- LINEMAN"	8/30/2020	$27.20	$9.25	$0.82	$1.00	$0.00	$38.27
EQUIPMENT OPERATOR (Class A CDL) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 For apprentice rates see "Apprentice- LINEMAN"	8/30/2020	$42.03	$9.25	$1.26	$13.09	$0.00	$65.63
EQUIPMENT OPERATOR (Class B CDL) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 For apprentice rates see "Apprentice- LINEMAN"	8/30/2020	$37.09	$9.25	$1.11	$9.76	$0.00	$57.21
GROUNDMAN OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 For apprentice rates see "Apprentice- LINEMAN"	8/30/2020	$27.20	$9.25	$0.82	$1.00	$0.00	$38.27
GROUNDMAN -Inexperienced (<2000 Hrs.) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 For apprentice rates see "Apprentice- LINEMAN"	8/30/2020	$22.25	$9.25	$0.82	$1.00	$0.00	$33.32
JOURNEYMAN LINEMAN OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2020	$49.45	$9.25	$1.48	$16.00	$0.00	$76.18

Apprentice: JOURNEYMAN LINEMAN

Effective Date: 8/30/2020

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$29.67	$9.25	$0.89	$2.50	$0.00	$42.31
2	65.00	$32.14	$9.25	$0.96	$2.50	$0.00	$44.85
3	70.00	$34.62	$9.25	$1.04	$2.50	$0.00	$47.41
4	75.00	$37.09	$9.25	$1.11	$4.00	$0.00	$51.45

Outside Electrical

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: JOURNEYMAN LINEMAN

Effective Date: 8/30/2020

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
5	80.00	$39.56	$9.25	$1.19	$4.00	$0.00	$54.00
6	85.00	$42.03	$9.25	$1.26	$4.00	$0.00	$56.54
7	90.00	$44.51	$9.25	$1.34	$6.00	$0.00	$61.10

TELEDATA CABLE SPLICER OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	2/4/2019	$30.73	$4.70	$0.92	$2.25	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	2/4/2019	$28.93	$4.70	$0.89	$2.25	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	2/4/2019	$28.93	$4.70	$0.89	$2.25	$0.00	$36.77

Additional Apprentice Information

All apprentices must be registered with the Division of Apprenticeship Training(DAS) in accordance with M.G.L.c. 23, §§ 11E-11L. Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the hourly prevailing wage rate established by the Commissioner under the provisions of M.G.L.c. 149, §§ 26-27D.

Apprentice ratios are established by DAS pursuant to M.G.L.c. 23, §§ 11E-11L. Ratios are expressed as the allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified. The ratios listed herein have been taken from relevant private collective bargaining agreements(CBAs) and are provided for illustrative purposes only. They have not been independently verified as being accurate or continuing to be accurate.

Parties having questions regarding what ratio to use should contact DAS.

DOCUMENT 00870

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS
(EXECUTIVE ORDER 11246)
Revised April 9, 2019

1. As used in these specifications:

   a. "Covered area" means the geographical area described in the solicitation from which this contract resulted:

   b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority.

   c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

   d. "Minority" includes:

      (i) Black (all persons having origins in any of the black African racial groups not of Hispanic origin);
      (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
      (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
      (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $ 10,000 the provisions of the specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in Paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

    a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

    b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

    c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

    d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

    e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

    f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

    g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

    h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11 The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as many be required by the Government and keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

APPENDIX A

The following goals and timetables for female utilization shall be included in all Federal and federally assisted construction contracts and subcontracts in excess of $ 10,000. The goals are applicable to the Contractor's aggregate on-site construction workforce whether or not part of that workforce is performing work on a Federal or federally-assisted construction contract or subcontract.

Area covered: Goal for Women apply nationwide

Goals and Timetables

Timetable	Goals (percent)
From Apr. 1, 1980 until further notice	6.9

APPENDIX B-80

Until further notice, the following goals for minority utilization in each construction craft and trade shall included in all Federal or federally assisted construction contracts and subcontracts in excess of $ 10,000 to be performed in the respective geographical areas. The goals are applicable to each nonexempt contractor's total on- site construction workforce, regardless of whether or not part of that workforce is performing work on a Federal, federally assisted or nonfederally related project, contract or subcontract.

Construction contractors participating in an approved Hometown Plan (see 41 CFR 6-4.5) are required to comply with the goals of the Hometown Plan with regard to construction work they perform in the area covered by the Hometown Plan. With regard to all their other covered construction work, such contractors are required to comply with the applicable SMSA or EA goal contained in this Appendix B-80.

Economic Areas

STATE:	Goals (percent)
MASSACHUSETTS	
004 Boston MA: SMSA Counties: 1123 Boston-Lowell-Brockton-Lawrence-Haverhill, MA-NH	4.0
MA Essex, MA Middlesex, MA Norfolk, MA Plymouth, MA Suffolk, NH Rockingham.	
5403 Fall River- New Bedford MA, Bristol	1.6
9243 Worcester-Fitchburg-Leominster, MA	1.6
6323 Springfield-Chicopee-Holyoke MA-CT MA Hampden, MA Hampshire	4.8
Non-SMSA Counties: MA Barnstable, MA Dukes, MA Nantucket	3.6
Non-SMSA Counties: MA Franklin	5.9

APPENDIX C

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Acts and Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

3. **Solicitations for Subcontractors, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to nondiscrimination on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status.

4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto, and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Massachusetts Department of Transportation (MassDOT) or FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor will so certify to MassDOT or FHWA, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Nondiscrimination provisions of this contract, MassDOT will impose such contract sanctions as it or FHWA may determine to be appropriate, including, but not limited to:

    a. withholding payments to the contractor under the contract until the contractor complies; and/or
    b. cancelling, terminating, or suspending a control, in whole or in part.

6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as MassDOT or FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request MassDOT to enter into any litigation to protect the interests of MassDOT. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

APPENDIX D

During the performance of this contact, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor," which includes consultants) agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

PERTINENT NON-DISCRIMINATION AUTHORITIES:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21

- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-Aid programs and projects)

- Federal-Aid Highway Act of 1973 (23 U.S.C. § 324 *et seq.*) (prohibits discrimination on the basis of sex)

- Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 *et seq.*), as amended (prohibits discrimination on the basis of disability) and 49 CFR Part 27

- The Age Discrimination Act of 1975, as amended (42 U.S.C. § 6101 *et seq.*) (prohibits discrimination on the basis of age)

- Airport and Airway Improvement Act of 1982 (49 U.S.C. § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex)

- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage, and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975, and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of Federal-Aid recipients, sub-recipients, and contractors, whether such programs or activities are Federally funded or not)

- Titles II and III of the Americans with Disabilities Act (42 U.S.C. §§ 12131-12189), as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38 (prohibits discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities)

- The Federal Aviation Administration's Non-Discrimination Statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex)

- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations)

- Executive Order 13166, Improving Access to Services for People with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100)

- Title IX of the Education Amendments Act of 1972, as amended (20 U.S.C. 1681 *et seq*.) (prohibits discrimination on the basis of sex in education programs or activities)

*** END OF DOCUMENT ***

DOCUMENT 00875
TRAINEE SPECIAL PROVISIONS
Revised October, 2016

THE REQUIRED NUMBER OF TRAINEES TO BE TRAINED UNDER THIS CONTRACT WILL BE **4**

The contractor shall provide on-the job training aimed at developing full journeyworkers in the type of trade of job classification involved.

In the event that a contractor subcontracts a portion of the contract work, the General Contractor shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided, however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this training special provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeyworkers in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to the Massachusetts Department Of Transportation (MassDOT) for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyworker status is a primary objective of the Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority and women trainees (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that have been taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training.

No employee shall be trained under this Special Provision in any classification in which he or she has successfully completed a training course leading to journeyworker status or in which he or she has been employed as a journeyworker. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the contractor's records should document the finding in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Massachusetts Department Of Transportation and the Federal Highway Administration. The Massachusetts Department Of Transportation and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyworker status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather that clerk-typist or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc. where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Federal Highway Administration division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Reimbursement

Under these Training Special Provisions, reimbursement will be as follows:

The Contractor will only be reimbursed 80 cents for each hour of on the job training as specified in the approved Training Program.

The Contractor is advised and encouraged that it may train additional persons in excess of the number specified and will be reimbursed as stated above. Reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement.

If less than full training specified in the approved training programs is provided, payment to the contractor will be made at a rate of 80 cents for each hour of training completed under this contract. However, no payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyworker, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this Training Special Provision.

Payment

Trainees will be paid:

1. Percentage (%) of the journeyworker's rate as provided in the existing programs approved by the Department of Labor or Transportation as of September 15, 1970.

2. For journeyworker programs submitted by the Contractor and approved by Massachusetts Department Of Transportation and the Federal Highway Administration at least 60 percent of the appropriate minimum journeyworker's rate specified in the contract for the first half of the training period, 75 percent for the third quarter if the training period, and 90 percent for the last quarter of the training period.

3. For skilled laborer programs, the minimum starting wage rate of unskilled laborer. At the conclusion of training, he or she will be paid the minimum wage rate of the Classification for programs submitted by the Contractor and approved by the Massachusetts Department Of Transportation and the Federal Highway Administration.

4. For the purposes of meeting the legal requirements of State Prevailing Wage Law, please be advised that no person may be paid the Apprentice wage rate as listed on a MA Prevailing Wage Rates schedule, unless that person and program is registered with the Department of Labor Standards/Division of Apprentice Standards (DLS/DAS). Any person or program not registered with DLS/DAS, regardless of whether or not they are registered with any other federal, state, local, or private entity must be paid the journeyworker’s rate for the trade.

The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

Form FHWA-1409, Federal-aid Highway Construction Contracting Semi Annual Training Report, shall be submitted as per instructions on the Form.

*** END OF DOCUMENT ***

DOCUMENT 00880

Revised January 12, 2022

DEPARTMENT OF LABOR

Employment Standards Administration

MINIMUM WAGES FOR FEDERAL AND FEDERALLY ASSISTED CONTRACTS

"General Decision Number: MA20250025 07/11/2025

Superseded General Decision Number: MA20240025

State: Massachusetts

Construction Type: Highway

County: Worcester County in Massachusetts.

HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the

Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	03/21/2025
2	07/11/2025

CARP0336-004 03/01/2025

	Rates	Fringes
CARPENTER (Includes Form Work)	$ 49.10	31.20

ELEC0103-007 03/01/2025

	Rates	Fringes
ELECTRICIAN	$ 64.26	36.99

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* ENGI0004-030 06/01/2025

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1	$ 57.83	33.70
Group 2	$ 57.18	33.70

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:
A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Labor Day, Memorial Day, Independence Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS
Group 1: Backhoe/Excavator/Trackhoe; Bobcat/Skid Steer/Skid Loader; Broom/Sweeper; Gradall; Loader; Paver (Asphalt, Aggregate, and Concrete); Post Driver (Guardrail/Fences)
Group 2: Bulldozer; Grader/Blade; Roller

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* ENGI0004-031 06/01/2025

	Rates	Fringes

POWER EQUIPMENT OPERATOR:
(Milling Machine).....$ 57.83 33.70

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:
A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Labor Day, Memorial Day, Independence Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

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IRON0007-028 03/16/2024

	Rates	Fringes
IRONWORKER, STRUCTURAL.....	$ 54.38	36.48

IRON0007-029 03/16/2024

	Rates	Fringes
IRONWORKER, ORNAMENTAL.....	$ 54.68	36.48

LABO0039-003 06/01/2018

	Rates	Fringes
LABORER		
Asphalt, Includes Raker, Shoveler, Spreader and Distributor.....	$ 33.50	22.92
Common or General.....	$ 33.25	22.92
Guardrail Installation.....	$ 33.50	22.92

PAIN0035-023 07/01/2024

	Rates	Fringes
PAINTER (Steel).....	$ 56.76	36.00

SUMA2014-015 01/11/2017

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	$ 56.70	21.08
IRONWORKER, REINFORCING.....	$ 56.48	20.62
LABORER: Concrete Saw (Hand Held/Walk Behind).....	$ 41.78	18.37

LABORER: Landscape	$ 40.39	17.68
OPERATOR: Crane	$ 52.14	21.08
OPERATOR: Forklift	$ 64.67	0.00
OPERATOR: Mechanic	$ 48.14	17.02
OPERATOR: Piledriver	$ 44.46	16.94
PAINTER: Spray (Linestriping)	$ 48.00	0.00
PILEDRIVERMAN	$ 45.65	23.33
TRAFFIC CONTROL: Flagger	$ 23.00	20.44
TRAFFIC CONTROL: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper	$ 44.49	12.41
TRUCK DRIVER: Concrete Truck	$ 33.69	15.79
TRUCK DRIVER: Dump Truck	$ 30.38	7.20
TRUCK DRIVER: Flatbed Truck	$ 48.53	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at

https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination

b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

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DOCUMENT A00801

SPECIAL PROVISIONS

MENDON
Federal Aid Project No. NHP(NHS)-003S(866)X
Resurfacing and Related Work on Route 16

Labor participation goals for this Project shall be 15.3% for minorities and 6.9% for women for each job category. The goals are applicable to both Contractor's and Subcontractor's on-site construction workforce. Refer to Document 00820 for details.

SCOPE OF WORK

All work under this Contract shall be done in conformance with the *2025 Standard Specifications for Highways and Bridges, the Supplemental Specifications* contained in this book, the *Construction Standard Details* in effect as of June, 2025, the *1990 Standard Drawings for Signs and Supports*, the 2015 *Overhead Signal Structure and Foundation Standard Drawings*, the *2009 Manual on Uniform Traffic Control Devices (MUTCD) with Revisions 1, 2, and 3 and the November 2022 Massachusetts Amendments to the MUTCD, the 1968 Standard Drawings for Traffic Signals and Highway Lighting*, the latest edition of The *American Standard for Nursery Stock*, the Plans and these Special Provisions.

The work under this Contract includes, but is not limited to, clearing and grubbing; full depth construction; roadway widening; milling; paving; reconstructing driveways; HMA sidewalks and cement concrete pedestrian curb ramps; a HMA shared use path; repair existing concrete box culvert; landscaping; installing new granite curbing and HMA berm; installing highway guardrail; new stormwater drainage pipes and structures; new fencing; providing and spreading loam borrow and seed; water main and gas relocation by others; tree trimming; traffic signal installation; traffic signing and pavement markings; traffic control management, secondary street improvements, placing erosion control measures as required; grading and compacting; relocation of utility poles and overhead wires; shrubs within The Project's Right-of-Way; and other incidental items required to complete the work as shown on the Plans, as specified herein, and as required by the Engineer.

The proposed culvert repair work shall be cast in place including wingwalls, and foundations. The work required to remove the existing upstream headwall of the culvert and install the new culvert section and headwall is to be completed with no restrictions to traffic on Route 16. Temporary support of excavation along the existing Route 16 culvert, control of water within the stream, and a temporary work zone in the Route 16 roadway will be required for construction of the culvert.

SUBSECTION 7.05 INSURANCE REQUIREMENTS
B. Public Liability Insurance

The insurance requirements set forth in this subsection are in addition to the requirements of the Standard Specifications and supersede all other requirements.

Paragraphs 1 and 2

The Massachusetts Department of Transportation and applicable railroads shall be named as additional insureds.

Paragraph 4

Asbestos Liability Insurance shall be obtained for this project. The Contractor and the Massachusetts Department of Transportation shall be named as additional insureds.

CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Prospective bidders are required to submit all questions to the Construction Contracts Engineer by 3:00 P.M. on the Tuesday of the previous week before the scheduled bid opening date. Any questions received after this time will not be considered for review by the Department.

Contractors should email questions and addendum acknowledgements to the following email address massdotspecifications@dot.state.ma.us The MassDOT project file number and municipality is to be placed in the subject line.

WORK SCHEDULE AND NIGHTTIME WORK REQUEST

Work hours shall be from 7:00AM to 3:00PM Monday-Friday. No weekend work including Friday night after 3:00PM, and all-day Saturday and Sunday, will be permitted unless written approval is provided by the Town of Mendon and MassDOT. Night work is only allowed for the reconstruction of the culvert headwall at Muddy Brook. Any lane closure for reconstruction will occur after 9:00PM and open prior to 5:00AM. Written approval by the engineer is required for any night work operations.

NORTHERN LONG-EARED BAT AND TRICOLORED BAT PROTECTION

The northern long-eared bat (*Myotis septentrionalis*; NLEB) and tricolored bat (*Perimyotis subflavus*; TCB) are listed as federally endangered or proposed endangered, respectfully, under the Endangered Species Act (ESA). The U.S. Fish and Wildlife Service (USFWS) developed this guidance to address ESA compliance and promote conservation of NLEB and TCB. This project has been consulted with the USFWS through the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and Federal Transit Administration (FTA) Programmatic Biological Opinion for Transportation Projects in the Range of the Indiana Bat and Northern Long-Eared Bat revised February 5, 2018 and amended March 31, 2023.

On August 3-6, 2021, Stantec, on behalf of MassDOT Highway Division Environmental Services, conducted a northern long-eared bat summer presence/absence survey using acoustic detection methods, in accordance with the 2020 survey guidelines. The survey confirmed the presence of NLEB and/or TCB, and as stated within the survey guidelines, the survey is valid for five years. If additional stressor producing work is proposed by the Contractor past this date, additional review is required by the MassDOT Highway Division's Environmental Services Section, and additional review and restrictions may be required by the USFWS.

The project is eligible for a May Affect, Not Likely to Adversely Affect (NLAA) determination, with Avoidance and Minimizations Measures (AMMs), in accordance with the FHWA, FRA and FTA Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat. On behalf of FHWA, the lead federal agency for Section 7 consultation, MassDOT submitted a Programmatic Consultation for Transportation Projects affecting NLEB or Indiana Bat to the USFWS through the Information for Planning and Consultation (IPaC) webpage and generated a NLAA documentation letter (see **Document A00844USFWS NLAA**). Therefore, the project has completed Section 7 consultation through the ESA.

In advance of the uplisting of the TCB to endangered under the ESA, the following Avoidance and Minimization Measures (AMMs) must be strictly adhered to in order to protect NLEB and TCB and to be in compliance with the ESA. Contact MassDOT Environmental Services - Wildlife Unit Supervisor for questions about project limits, restrictions, or conservation measures.

General AMM

- The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and TCB, including all applicable AMMs. NLEB and TCB information (https://www.fws.gov/midwest/endangered/mammals/nleb/ and https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus) shall be made available to all personnel.

Lighting AMMs

- Direct temporary lighting away from suitable habitat during the active season: **April 1 to October 31.**
- When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the BUG system developed by the Illuminating Engineering Society, be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable.

NORTHERN LONG-EARED BAT AND TRICOLORED BAT PROTECTION (Continued)

Tree Removal AMMs

- *If additional cutting is proposed by the Contractor that is outside the scope of this contract, additional review is required by the MassDOT Highway Division's Environmental Services Section, and additional review and restrictions may be required by the USFWS.*
- Ensure tree removal is limited to that specified in project plans and ensure that contractors understand clearing limits and how they are marked in the field (e.g., install bright colored flagging/fencing prior to any tree clearing to ensure contractors stay within clearing limits).
- No tree cutting shall be conducted during the active season: **April 1 to October 31.**
- No tree cutting shall be conducted during the active season: **April 1 to October 31**, or if cutting inside of this timeframe is required, tree removal is limited to 10 or fewer trees per project at any time of year within 100 feet of existing road/rail surface and outside of documented roosting/foraging habitat or travel corridors; and a visual emergence survey must be conducted by *MassDOT Highway Division's Environmental Services Section or appointed representative* with no bats observed.
- Do not remove **documented** or NLEB and/or TCB roosts that are still suitable for roosting, or trees within 0.25 miles of roosts, or **documented** foraging habitat any time of year.
- The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and/or TCB, including the **TOY** restriction. If this restriction needs to be waived at any location(s) the Resident Engineer shall send a locus map of the proposed work to MassDOT Highway Division's Environmental Services Section for review and a determination if the restriction can be waived.

EMERALD ASH BORER ADVISORY

To the extent possible, all trees and brush shall be disposed on site, typically chipped and spread in place. When trees or brush must be removed, such as in urban, or otherwise populated areas, Contractor shall identify proposed location for disposal, and provide written notification to the Engineer for approval. Disposal shall be in city or town of project, or at minimum, within county, of construction operations.

EQUIVALENT SINGLE AXLE LOADS (ESALS)

The estimated traffic level to be used for SUPERPAVE HMA mixture designs for this contract, expressed in Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period, is 1,9 million 18-kip (80-kn) ESALs.

FISHERIES PROTECTION

To minimize potential impacts to state listed fish, no work associated with the Muddy Brook culvert replacement portion of the project shall occur from April 1- May 31. If construction work is not finished by April 1 of a given year, the applicant shall provide the Division with a detailed hydraulic control plan to allow for fish passage to occur through the work area during April 1- May 31. Contractor to provide shop drawings for review to MassDOT, The Engineer and The Division for review prior to commencement of work.

HOLIDAY WORK RESTRICTIONS

(Supplementing Subsection 7.09)

The District Highway Director (DHD) may authorize work to continue during these specified time periods if it is determined by the District that the work will not negatively impact the traveling public. DHD may allow work in those areas on a case by case basis and where work is behind barrier and will not impact traffic.

Below are the holiday work restrictions:

New Years Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Martin Luther King's Birthday (Federal Holiday)
No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

President's Day (Federal Holiday)
No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

Evacuation Day (Suffolk County State Holiday)
No work restrictions due to traffic concerns.

Patriot's Day (State Holiday)
Work restrictions will be in place for Districts 3 and 6 along the entire Boston Marathon route and any other locations that the DHD in those districts determine are warranted so as to not to impact the marathon. All other districts work restrictions will be as per DHD.

Mother’s Day
No work on Western Turnpike and Metropolitan Highway System from 5:00 AM on the Friday before, until the normal start of business on the following day.

HOLIDAY WORK RESTRICTIONS (Continued)

Memorial Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Bunker Hill Day (Suffolk County State Holiday)
No work restrictions due to traffic concerns.

Juneteenth
No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

Independence Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Labor Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Columbus Day (Federal Holiday)
No work on major arterials from 5:00 AM on the Friday before, until the normal start of business on the following day

Veterans' Day (Federal Holiday)
No work restrictions due to traffic concerns.

Thanksgiving Day (Federal Holiday)
No work on major arterials from 5:00 AM two days before until the normal start of business on the following Monday.

Christmas Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day.

BIDDERS LIST

Pursuant to the provisions of 49 CFR Part 26.11 all official bidders will be required to report the names, addresses and telephone numbers of all firms that submitted bids or quotes in connection with this project. Failure to comply with a written request for this information within 15 business days may result in a recommendation to the Prequalification Committee that prequalification status be suspended until the information is received.

The Department will survey all firms that have submitted bids or quotes during the previous year prior to setting the annual goal and shall request that each firm report its age and gross receipts for the year.

BUILD AMERICA BUY AMERICA PREFERENCE

On Federally-aid projects the Buy America (23.CFR § 635.410) and Build America, Buy America Act (Pub. L. No. 117-58, §§ 70901-52). requires the following,

(1) all iron and steel used in the project are produced in the United States--this means all manufacturing processes, from the initial melting stage through the application of coatings, must occur in the United States. Foreign steel and iron can be used if the cost of the materials does not exceed 0.1% of the total Contract cost or $2,500, whichever is greater. The action of applying a coating to a covered material (i.e., steel and iron) is deemed a manufacturing process subject to Buy America. Coating includes epoxy coating, galvanizing, painting and any other coating that protects or enhances the value of a material subject to requirements of Build America, Buy America. Steel used for temporary support of excavation, including H piles, soldier piles, and sheeting when the steel is required to be left in place is subject to requirements of Build America, Buy America. Temporary steel, shall remain in place when it falls within the influence zone of the soil supporting any structure or railroad tracks.

(2) all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and

BUILD AMERICA BUY AMERICA PREFERENCE (Continued)

(3) all construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States. "Construction materials" includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of:

- non-ferrous metals,
- plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables),
- glass (including optic glass),
- lumber; or
- drywall.

The Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project but are not an integral part of the structure or permanently affixed to the infrastructure project.

NOTE: The requirements for manufactured products indicated in paragraph (2) above are not in effect for this contract.

SOIL STOCKPILING DIRECTIVE P-22-001

Any stockpiling of soil must be performed in compliance with Policy Directive P-22-001, Off-Site Stockpiling of Soil from MassDOT Construction Projects. This directive limits the allowable locations for off-site stockpiling of soil generated during MassDOT projects and includes various requirements that must be satisfied by the contractor prior to off-site stockpiling. The Contractor is responsible for identifying a suitable stockpile location.

CONTAMINATED SOIL

Soil to be removed from the project area shall not be assumed to be uncontaminated and must be evaluated prior to off-site management for potential contamination with hazardous materials. No soil may be disposed of off-site without proper assessment by the contractor and approval from the Resident Engineer (RE), District Environmental Engineer (DEE), or the project designee.

SUBSECTION 8.02 SCHEDULE OF OPERATIONS

Replace this subsection with the following:

An integrated cost and schedule controls program shall be implemented by the Contractor to track and document the progress of the Work from Notice to Proceed (NTP) through the Contractor Field Completion (CFC) Milestone. The Contractor's schedules will be used by the Engineer to monitor project progress, plan the level-of-effort required by the Department's work force and consultants and as a critical decision-making tool. Accordingly, the Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both accurate and updated as required by the specification throughout the life of the project. Detailed requirements are provided in Division II, Section 722 Construction Scheduling.

TRUCK SAFETY DEVICES

(Supplementing Subsection 7.04: Motor Vehicles)

All motor vehicles subject to section 7 of chapter 90 to be operated under this Contract shall be equipped with safety devices as provided therein and in 540 CMR 4.00.

By December 31, 2025, the contractor shall certify to the Registry of Motor Vehicles, in a manner prescribed by the Registrar, that all applicable vehicles are equipped with Lateral Protective Devices, Convex Mirrors, Cross Over Mirror(s) and Back Up Cameras in accordance with the requirements of 540 CMR 4.00.

The Contractor shall provide evidence satisfactory to the Department to demonstrate compliance with the above certification requirement for all applicable vehicles operated under this contract by the Contractor and its subcontractors and vendors in a manner set forth by the Department. Thereafter, the Contractor shall have an affirmative obligation to continue to provide such evidence of compliance on an ongoing basis and no later than 7 days after certification with the Registry of Motor Vehicles of any additional vehicles operated under this contract by the Contractor and its subcontractors and vendors.

Non-compliance with respect to a vehicle that is subject to 540 CMR 4.00 may subject the Contractor to statutory fines as established in M.G.L. c. 90, § 7 and/or contractual remedies up to and including termination of the contract.

2026 FIFA WORLD CUP – BOSTON, MASSACHUSETTS

The 2026 FIFA World Cup will be held at Gillette Stadium in Foxborough and related events will be held throughout the region. Matches and Fan Fest activities are scheduled from June 11, 2026 through July 19, 2026. MassDOT will impose work restrictions as necessary to minimize traffic impacts during FIFA events when the Contractor's operations could impact vehicular traffic, particularly on interstate highways and major arterials throughout the region and local roads near the event site. No additional compensation will be allowed for work restrictions except as determined under Subsection 8.10

SUBSECTION 8.14 UTILITY COORDINATION, DOCUMENTATION, AND MONITORING RESPONSIBILITIES

A. GENERAL

In accordance with the provisions of Section 8.00 Prosecution and Progress, utility coordination is a critical aspect to this Contract. This section defines the responsibility of the Contractor and MassDOT, with regard to the initial utility relocation plan and changes that occur as the prosecution of the Work progresses. The Engineer, with assistance from the Contractor shall coordinate with Utility companies that are impacted by the Contractor's operations. To support this effort, the Contractor shall provide routine and accurate schedule updates, provide notification of delays, and provide documentation of the steps taken to resolve any conflicts for the temporary and/or permanent relocations of the impacted utilities. The Contractor shall provide copies to the Engineer of the Contractor communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Contractor.
- Providing meeting minutes for all utility-related meetings that the Contractor attends.
- Providing all test pit records.
- Request for Early Utility work requirements of this section (see below).
- Notification letters for any proposed changes to Utility start dates and/or sequencing.
- Written notification to the Engineer of all apparent utility delays within seven (7) Calendar Days after a recognized delay to actual work in the field – either caused by a Utility or the Contractor.
- Any communication, initiated by the Contractor, associated with additional Right-of-Way needs in support of utility work.
- Submission of completed Utility Completion Forms.

B. PROJECT UTILITY COORDINATION (PUC) FORM

The utility schedule and sequence information provided in the Project Utility Coordination Form (if applicable) is the best available information at the time of the bid and has been considered in setting the contract duration. The Contractor shall use all of this information in developing the bid price and the Baseline Schedule Submission, inclusive of the individual utility durations sequencing requirements, and any work that has been noted as potentially concurrent utility installations.

C. INITIATION OF UTILITY WORK

The Engineer will issue all initial notice-to-proceed dates to each Utility company based on either the:

1) Contractor's accepted Baseline Schedule
2) An approved Early Utility Request in the form of an Early Utility sub-net schedule (in accordance with the requirements of this Subsection)
3) An approved Proposal Schedule

C.1 - BASELINE SCHEDULE – UTILITY BASIS

The Contractor shall provide a Baseline Schedule submission in accordance with the requirements of Subsection 8.02 and inclusive of all of the information provided in the PUC Form that has been issued in the Contract documents. This is to include the utility durations, sequencing of work, allowable concurrent work, and all applicable considerations that have been depicted on the PUC Form.

SUBSECTION 8.14 (Continued)

C.2 – EARLY UTILITY REQUEST – (aka SUBNET SCHEDULE) PRIOR TO THE BASELINE

All early utility work is defined as any anticipated/required utility relocations that need to occur prior to the Baseline Schedule acceptance. In all cases of proposed early utility relocation, the Contractor shall present all known information at the pre-construction conference in the form of a 'sub-net' schedule showing when each early utility activity needs to be issued a notice-to-proceed. The Contractor shall provide advance notification of this intent to request early utility work in writing at or prior to the Pre-Construction meeting. Prior to officially requesting approval for early utility work, the Contractor shall also coordinate with MassDOT and all utility companies (private, state or municipal) which may be impacted by the Contract. If this request is acceptable to the Utilities and to MassDOT, the Engineer will issue a notice-to-proceed to the affected Utilities, based on these accepted dates.

C.3 – PROPOSAL SCHEDULE - CHANGES TO THE PUC FORM

If the Contractor intends to submit a schedule (in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02) that contains durations or sequencing that vary from those provided in the Project Utility Coordination (PUC) Form, the Contactor must submit this as an intended change, in the form of a Proposal Schedule and in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02. These proposed changes are subject to the approval of the Engineer and the impacted utilities, in the form of this Proposal Schedule and a proposed revision to the PUC form. The Contractor shall not proceed with any changes of this type without written authorization from the Engineer, that references the approved Proposal Schedule and PUC form changes. The submission of the Baseline Schedule should not include any of these types of proposed utility changes and should not delay the submission of the Baseline Schedule. As a prerequisite to the Proposal Schedule submission, and in advance of the utility notification(s) period, the Contractor shall coordinate the proposed utility changes with the Engineer and the utility companies, to develop a mutually agreed upon schedule, prior to the start of construction.

D. UTILITY DELAYS

The Contractor shall notify the Engineer upon becoming aware that a Utility owner is not advancing the work in accordance with the approved utility schedule. Such notice shall be provided to the Engineer no later than seven (7) calendar days after the occurrence of the event that the Contractor believes to be a utility delay. After such notice, the Engineer and the Contractor shall continue to diligently seek the Utility Owner's cooperation in performing their scope of Work.

In order to demonstrate that a critical path delay has been caused by a third-party Utility, the Contractor must demonstrate, through the requirements of the monthly Progress Schedule submissions and the supporting contract records associated with Subsection 8.02, 8.10 and 8.14, that the delays were beyond the control of the Contractor.

SUBSECTION 8.14 (Continued)

All documentation provided in this section is subject to the review and verification of the Engineer and, if required, the Utility Owner. In accordance with MassDOT Specifications, Division I, Subsection 8.10, a Time Extension will be granted for a delay caused by a Utility, only if the actual duration of the utility work is in excess of that shown on the Project Utility Coordination Form, and only if;

1) proper Notification of Delay was provided to MassDOT in accordance with the time requirements that are specified in this Section
2) the utility delay is a critical path impact to the Baseline Schedule (or most recently approved Progress Schedule)

E. LOCATION OF UTILITIES

The locations of existing utilities are shown on the Contract drawings as an approximation only. The Contractor shall perform a pre-construction utility survey, including any required test pits, to determine the location of all known utilities no later than thirty (30) calendar days before commencing physical site work in the affected area.

F. POST UTILITY SURVEY – NOTIFICATION

Following completion of a utility survey of existing locations, the Contractor will be responsible to notify the Engineer of any known conflicts associated with the actual location of utilities prior to the start of the work. The Engineer and the Contractor will coordinate with any utility whose assets are to be affected by the Work of this Contract. A partial list of utility contact information is provided in the Project Utility Coordination Form.

G. MEETINGS AND COOPERATION WITH UTILITY OWNERS

The Contractor shall notify the Engineer in advance of any meeting they initiate with a Utility Owner's representative to allow MassDOT to participate in the meeting if needed.

Prior to the Pre-Construction Meeting, the Contractor should meet with all Utility Owners who will be required to perform utility relocations within the first 6 months of the project, to update the affected utilities of the Project Utility Coordination Form and all other applicable Contract requirements that impact the Utilities. The Contractor shall copy the Engineer on any correspondence between the Utility Owner and the Contractor.

H. FORCE ACCOUNT / UTILITY MONITORING REQUIREMENTS

The Engineer will be responsible for recording daily Utility work force reports. The start, suspension, re-start, and completion dates of each of the Utilities, within each phase of the utility relocation work, will be monitored and agreed to by the Engineer and the Contractor as the work progresses.

I. ACCESS AND INSPECTION

The Contractor shall be responsible for allowing Utility owners access to their own utilities to perform the relocations and/or inspections. The Contractor shall schedule their work accordingly so as not to delay or prevent each utility from maintaining their relocation schedule.

COMPLIANCE WITH THE NATIONAL DEFENSE AUTHORIZATION ACT

(Supplementing Subsection 7.01)

On all projects, the "Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment" Regulation (2 CFR 200.216) prohibits the Contractor from using or furnishing the following telecommunications equipment or services:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

This prohibition applies to all products manufactured by the aforementioned companies, including any individual components or parts.

By submitting a bid on a project, the Contractor certifies that all work will be in compliance with the terms of 2 CFR 200.216. The Contractor shall submit a COC indicating compliance with the above provisions for all telecommunications equipment or services included in the Contract.

Payment for the item in which the materials are incorporated may be withheld until these COCs are received. Any cost involved in furnishing the certificate(s) shall be borne by the Contractor.

ENVIRONMENTAL PERMITTING

An Order of Conditions has been obtained from the Mendon Conservation Commission under the Wetlands Protection Act. Section 404 authorization has been obtained from the US Army Corps of Engineers under the Clean Water Act. If field conditions and/or Contractor-proposed erection, demolition, storage, or other procedures not originally allowed by existing environmental permits require work to occur in or otherwise impact water or wetland resource areas, the Contractor is advised that no associated work can occur until all required environmental permits have been either amended or obtained allowing such work. The Contractor must notify the District 3 Highway Director and Resident Engineer in writing at least 60 days prior to desired commencement of the proposed activity. All environmental submittals, including any contact with Local, State, or Federal environmental agencies, must be coordinated with the District 3 Environmental Engineer. The Contractor is expected to fully cooperate with requests for information and provide same in a timely manner. The Contractor is further advised that the Department will not entertain a delay claim due to the time required to modify or obtain the environmental permits.

VIBRATION MONITORING

Where vibratory construction methods (e.g. demolition or installation of excavation support members) are used within a distance of 100 feet of existing building or railroad, the Contractor shall provide all labor and equipment to monitor and report vibrations during the Work.

Contractor shall conduct vibration monitoring using portable seismographs to measure vibration levels resulting from construction activities. Provide at least two seismographs which have been calibrated within the previous three months to a standard that is traceable to the National Bureau of Standards. Seismograph monitoring locations shall be mutually agreed upon by the Engineer and Contractor. Vibrations shall be monitored on a continuous basis during excavation or support installation that use vibration or impact methods.

If vibration levels are found to exceed the maximum limits shown below, Contractor shall revise his construction operations as necessary to reduce vibration levels, at no additional cost to the Owner. The Engineer may require the Contractor to perform additional vibration monitoring if, in the opinion of the Engineer, conditions warrant such action.

Vibration monitoring shall be conducted by persons trained in the use of a seismograph and records shall be analyzed and results reported by persons familiar with analyzing and reporting the frequency content of a seismograph record. Limit construction vibrations to prevent damage to any adjacent building, structure, utilities, pipes or other features near the site. The Contractor is solely responsible to determine the maximum vibration tolerable at each location. However, in no case shall the following peak particle velocity criteria be exceeded.

Frequency (Hz)	Maximum Peak Particle Velocity (in. per. sec.)
Over 40	2.0
30 to 40	1.5
20 to 30	1.0
Less than 20	0.5

The contractor shall provide written reports of monitoring results to the Engineer within 24 hours of monitoring.

All costs associated with Vibration Monitoring are incidental to the contract cost and therefore the contractor shall not receive any additional compensation to where any vibration monitoring is needed under certain items.

Visual Inspection of Existing Walls

The Contractor shall inspect the existing retaining walls adjacent to excavation support systems used during demolition and construction of the proposed structure. The Contractor shall take photos of the walls prior to, during, and after the nearby construction. If distress in the existing wall is observed, the Contractor shall stop all work immediately and notify the Resident Engineer. Contractor shall submit to the Engineer at the completion of the nearby construction.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION FILE NUMBER SIGN

This project is subject to Massachusetts General Laws, Chapter 131, Section 40 as amended. Signs shall be in accordance with the latest MassDOT Construction Standards. All costs for the manufacture, erection, maintenance, moving, and removal of the signs shall be absorbed by the contractor with no additional compensation other than the contract unit prices.

For this project the Massachusetts Department of Environmental Protection File Number is 218-0853.

Any areas where the limit of work is less than 50 feet to the bordering vegetated wetland, the applicant shall install a double row of sediment controls separated by a minimum of 10 feet as required in the EPA's Construction General Permit (CGP). It is assumed that Standard 8 of MA DEP Stormwater Management requirements will not be met until the project is in compliance with this condition.

NOTICE TO OWNERS OF UTILITIES
(Supplementing Subsection 7.13)

Written notice shall be given by the Contractor to all public service corporations or municipal and State officials owning or having charge of publicly or privately owned utilities at least one week in advance of the commencement of operations that will affect the utilities. The Contractor shall file a copy of such notice with the Engineer.

Before commencing work on service connections, the Contractor shall be responsible for contacting the Electric Company servicing the area to obtain construction requirements, standards, and to give adequate notice of commencement of work. The Contractor's attention is further directed to the requirements of Work in the Immediate Vicinity of Certain Underground Structures and Poles herein included in these Special Provisions.

The following are the names of owners and representatives of the principal utilities may be affected, but completeness of this list is not guaranteed by the Department:

The following website lists the names and addresses of the utilities that may be affected, but the completeness of the list is not guaranteed:

https://www.mass.gov/info-details/utility-contacts-by-district-and-municipality

Select District 3
Select the Town (Mendon), and then locate the utility

Town officials are shown at website http://www.mass.gov

Under the "Your Government" tab select "Cities and Towns", then select the Cites and Towns websites and alphabetically select the required Town.

NOTICE TO OWNERS OF UTILITIES (Continued)

The following is the name and addresses of the agency which may be affected and must be notified. Completeness is not guaranteed by the Department. The Contractor shall assure that all affected agencies are notified.

ELECTRIC:
Outage/ Emergency: 1-800-465-1212
New Service: 1-800-375-7405
Customer Support: 1-800-322-3223

EVERSOURCE EMERGENCY TELEPHONE NUMBERS

GAS:
Outage/ Emergency: 800-592-2000
New Service: 866-678-2744
Customer Support: 800-592-2000

District Utility/Constructability Engineer

MassDOT District 3
Middlesex County

Ross Goodale
Ross.A.Goodale@dot.state.ma.us

Electric

National Grid Electric
55 Bearfoot Rd.
Northborough, MA 01532

Manny Munoz
manuel munoz@nationalgrid.com
401-895-9726

Gas

Tennessee Gas Pipeline Company
8 Anngina Drive
Enfield, CT 06082

David Wood
KMEncroachmentsNorth@kindermorgan.com
860-763-6005

Eversource Gas
995 Belmont Street
Brockton, MA 02301

Brendan Pitts
Brendan.pitts@eversource.com
508-895-4818

Enbridge
8 Wilson Way
Westwood, MA 0209

Kathy M. Aruda
kathleen.aruda@enbridge.com
508-938-7728

Telephone

Verizon
385 Myles Standish Blvd.
Taunton, MA 02780

Karen Mealey
karen.m.mealey@verizon.com
MARI-UGRecordRequest@verizon.com
774-409-3160

NOTICE TO OWNERS OF UTILITIES (Continued)

Water

Mendon Water Dept.
20 Main Street (Town Hall)
Mendon, MA 01756

Dwight Watson
-
508-634-2656

Hopedale Water & Sewer Department
78 Hopedale Street
Hopedale, MA 01824

Tim Watson
-
508-634-2203

Cable

Comcast Cable Corporation
PO Box 6505, 5 Omni Way
Chelmsford, MA 01824

Wendy Brown
Wendy_Brown@comcast.com
978-848-5163

Crown Castle
80 Central Street
Boxborough, MA 01719

Mark Bonanno
mark.bonanno@crowncastle.com
508-616-7818

Mendon DPW

Mendon Highway Department
66 Providence Street
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SECTION 722
CONSTRUCTION SCHEDULING
DESCRIPTION

722.20 General

The Contractor's approach to prosecution of the Work shall be disclosed to the Department by submission of a Critical Path Method (CPM) schedule and a cost/resource loaded Construction Schedule as defined by the schedule type set forth below. These requirements are in addition to any requirements imposed in other sections.

This section establishes the requirement for scheduling submissions. There are four schedule types identified as types A, B, C and D.

All schedules shall be prepared and submitted in accordance with this specification and the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit.

Type A –

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded & Resource Loaded CPM
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software and computer

Type B –

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded & Resource Loaded CPM
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software and computer

Type C –

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software and computer

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Type D -

- Bar chart schedule updated monthly or at the request of the Engineer
- Short-term Construction Schedule
- Monthly Projected Spending Report (PSR)

EQUIPMENT, PERSONNEL

722.40 General

A. **Software Requirements**

The Contractor shall use Primavera P6 computer scheduling software.

In addition to the requirements of Section 740 – Engineer's Field Office and Equipment, the Contractor shall provide to the Department one (1) copy of the scheduling software, one (1) software license and one (1) computer capable of running the scheduling software for the duration of the Contract. This computer and software shall be installed in the Engineer's Field Office. The computer and software shall be maintained and serviced at no additional cost to the Department.

B. Scheduler Requirements

The Scheduler shall be approved by the Engineer.

For Type A, B and C Schedules the name of the Contractor's Project Scheduler together with his/her qualifications shall be submitted to the Department for approval by the Engineer within seven (7) Calendar Days after NTP. The Project Scheduler shall have a minimum of five (5) years of project CPM scheduling experience, three (3) years of which shall be on projects of similar scope and value as the project for which the Project Scheduler is being proposed. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler.

SCHEDULING METHODS

722.60 General

A. **Schedule Planning Session**

The Contractor shall conduct a schedule planning session prior to submission of the Baseline Schedule. This session will be attended by the Department and its consultants. During this session, the Contractor shall present its planned approach to the project including, but not limited to:

1. the Work to be performed by the Contractor and its subcontractors;
2. the planned construction sequence and phasing; planned crew sizes;
3. summary of equipment types, sizes, and numbers to be used for each work activity;
4. all early work related to third party utilities;
5. identification of the most critical submittals and projected submission timelines;
6. estimated durations of major work activities;
7. the anticipated Critical Path of the project and a summary of the activities on that Critical Path;
8. a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage and control those challenges;

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9. a summary of the anticipated quarterly cash flow over the life of the project.

This will be an interactive session and the Contractor shall answer all questions that the Department and its consultants may have. The Contractor shall provide a written summary of the information presented and discussed during the session to the Engineer. The Contractor's Baseline Schedule and accompanying Schedule Narrative shall incorporate the information discussed at this Schedule Planning Session.

B. **Schedule Reviews by the Department**

1. Baseline Schedule Reviews
   The Engineer will respond to the Baseline Schedule Submission within thirty (30) Calendar Days of receipt providing comments, questions and/or disposition that either accepts the schedule or requires revision and resubmittal. Rejected Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.
2. Contract Progress Schedule / Monthly Update Reviews / Recovery Schedules
   The Engineer will respond to each submittal within twenty-one (21) Calendar Days. Rejected schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

The Engineer's review comments shall not be construed as direction to change the Contractor's means and methods. The review and acceptance of the CPM schedule does not relieve the Contractor of the responsibility for accomplishing the work within the contract required completion dates. Omissions and errors in the accepted CPM schedule shall not excuse performance less than that required by the Contract.

722.61 Schedule Content and Preparation Requirements

All schedules shall be prepared and submitted in accordance with the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at:
https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit
and the following:

A. **LOGIC**

The schedules shall divide the Work into activities with appropriate logic ties to show:

1. conformance with the requirements of this Section and Division I, Subsection 8.02 - Schedule of Operations
2. the Contractor's overall approach to the planning, scheduling, and execution of the Work
3. conformance with any additional sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.

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B. **ACTIVITIES**

The schedule shall clearly define the progression of the Work from the Notice to Proceed (NTP) to Contractor Field Completion (CFC) by using separate activities, or including attributes within appropriate activities, to address each of the following:

1. Notice to Proceed
2. Work Breakdown Structure
3. The Critical Path is clearly defined and organized.
4. Float shall be clearly identified.
5. Detailed activities to satisfy permit requirements.
6. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
7. The preparation and submission of shop drawings, procedures, and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable.
8. The review and return of shop drawings, procedures, and other required submittals, approved or with comments, the duration of which shall be thirty (30) Calendar Days, unless otherwise specified or as approved by the Engineer.
9. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before procuring and fabricating.
10. Each component of the Work defined by specific activities.
11. Right-of-Way (ROW) takings that have been identified in the Contract.
12. Early Utility Relocation (by others) that has been identified in the Contract.
13. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third-party work affecting the Contract.
14. Utility work to be performed in accordance with the Project Utility Coordination (PUC) Form as provided in Section 8.14 - Utilities Coordination, Documentation and Monitoring Responsibilities
15. Access Restraints – restrictions on access to areas of the Work that are defined by the Department in the bid package, in Subsection 8.06 – Limitations of Operations or elsewhere in the Contract
16. Limitations of Work – time of year restrictions and any other limitations identified in the contract
17. Traffic work zone set-up and removal, night work and phasing
18. Material Certifications
19. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
20. For Type A and B Contracts only: All items to be paid for, including all Unit Price and Lump Sum pay items, shall be identified by activity. This shall include all non-construction activities such as engineering work; purchase of permanent materials and equipment, purchase of structural steel stock, equipment procurement, equipment delivery to the site or storage location and the representative amount of overhead/indirect costs that was included in the Contractor's Bid Prices.

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21. Contractor's request for validation of FBU (ready to open to traffic)
22. Full Beneficial Use (FBU) Contract Milestone per the following requirements: The majority of contract Work has been completed and the asset(s) has been opened for full multi-modal transportation use, except for limited contract work items that do not materially impair or hinder the intended public use of the transportation facility. All anticipated lane takings have been completed, except for minor, short term work items and as defined in Subsection 8.03 - Prosecution of Work
23. The Department's confirmation of completed work to allow for FBU.
24. Contractor's request for validation of Substantial Completion
25. Department generated punch list of twenty-one (21) Calendar Days
26. Substantial Completion Contract Milestone as defined in the standard specifications.
27. Punch list Completion Period of at least thirty (30) Calendar Days per the requirements of Subsections 5.11 - Final Acceptance, 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes
28. Contractor confirmation that all punchlist work and documentation has been completed.
29. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
30. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
31. Contractor Field Completion Contract Milestone (which can also be considered the completion date) per the following requirements: All physical contract Work is complete including punchlist. The Contractor has fully de-mobilized from field operations and as defined in Subsection 5.11

C. **EARLY AND LATE DATES**

Early Dates shall be based on proceeding with the Work or a designated part of the Work exactly on the date when the corresponding Contract Time commences. Late Dates shall be based on completing the Work or a designated part of the Work exactly on the corresponding Contract Time, even if the Contractor anticipates early completion.

D. **DURATIONS**

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration of resources and production rates that correspond to the Contractor's Bid Price. Within all of the Department-required schedules, the Contractor shall plan the Work using durations for all physical construction activities of no less than one (1) Work Day and no greater than fourteen (14) Work Days, unless approved by the Engineer as part of the Baseline Schedule Review.

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Should there be an activity with a duration that is determined by the Engineer to be unreasonable, the Contractor will be asked to provide a basis of the duration using bid documents, historic production rates for similar work, or other form of validation that is acceptable to the Engineer. Should the Contractor and the Engineer be unable to agree on reasonable activity durations, the Engineer will, at a minimum, note the disagreement in the Baseline Schedule Review along with a duration the Engineer considers reasonable and the basis for that duration. A schedule that contains a substantial number of activities with durations that are deemed unreasonable by the Engineer will not be accepted.

E. **MATERIALS ON HAND**

The Contractor shall identify in the Baseline Schedule all items of permanent materials (Materials On Hand) for which the Contractor intends to request payment prior to the incorporation of such items into the Work.

F. **ACTIVITY DESCRIPTIONS**

The Contractor shall use activity descriptions in all schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label.

G. **ACTIVITY IDENTIFICATION NUMBERS**

The Contractor shall use the activity identification numbering system specified in the MassDOT Highway Division Contractor Construction Schedule Toolkit.

H. **ACTIVITY CODES**

The Contractor shall use the activity codes specified in the MassDOT Highway Division Contractor Construction Schedule Toolkit.

I. **CALENDARS**

Different calendars may be created and assigned to all activities or to individual activities. Calendars define the available hours of work in each Calendar Day, holidays and general or project-specific non-Work Days such as Fish Migration Periods, time-of-year (TOY) restrictions and/or area roadway restrictions. All calendars shall extend two years beyond the current project completion date.

Project Special Provisions identify specific calendar restrictions some examples of special calendars include, but are not limited to:

- Winter Shutdown Period, specific work is required by separate special provision to be performed during the winter. See Special Provision 8.03 (if applicable)
- Peak traffic hours on heavily traveled roadways. This shall be from 6:30 am to 9:30 am and from 3:30 pm to 7:00 pm, unless specified differently elsewhere in the Contract.
- Special requirements by sensitive abutters, railroads, utilities and/or other state agencies as defined in the Contract.
- Planting seasons for trees, shrubs and grasses and wetlands mitigation work.

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- Cape Cod and the Islands Summer Roadway Work Restrictions: A general restriction against highway and bridge construction is enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer. Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod and the Islands, project-specific restrictions may be enforced.
- Turtle and/or Fish Migration Periods and/or other in-water work restrictions: Refer to the Project Special Provisions for specific restrictions.
- Working over Waterways Restricted Periods.
- Night-time paving and striping operations, traffic, and temperature restrictions.
- Utility Restrictions shall be as specified within the Contract.

J. **FLOAT**

For the calculation of float in the CPM schedule, the setting for *Retained Logic* is required for all schedule submissions, starting with the Baseline Schedule Submission. Should the Contractor have a reason to propose that an alternative calculation setting such as *Progress Override* be used, the Contractor shall obtain the Engineer's approval prior to modifying to this setting.

K. **COST AND RESOURCE LOADING (Types A and B only)**

For all Type A and B Schedules, the Contractor shall provide a cost and resource-loaded schedule with an accurate allocation of the costs and resources necessary to complete the Work. The costs and resources shall be assigned to all schedule activities in order to enable the Contractor to efficiently execute the Contract requirements and the Engineer to validate the original plan, monitor progress, provide cash flow projections, and analyze delays.

1. Each schedule activity shall have an assigned cost that accurately represents the value of the Work. Each schedule activity shall have its resources assigned to it by craft and the anticipated hours to accomplish the work. Each schedule activity's equipment resources shall be assigned to it by equipment type and hours operated. Front-loading or other unbalancing of the cost distribution will not be permitted.
2. The sum of the cost of all schedule activities shall be equal to the Contractor's Bid Price.
3. Indicating the labor hours per individual, per day, by craft and equipment hours/day will be acceptable.
4. The Engineer reserves the right to use the cost-loading as a means to resolve changes, disputes, time entitlement evaluations, increases or decreases in the scope of Work, unit price renegotiations and/or claims.
5. For all Type A and B Schedules, all subnets, fragnets, Proposal Schedules, and Recovery Schedules shall be cost and resource- loaded to help to quickly validate and monitor the duration of the Work to be performed.
6. For Type A Schedules, cost-loading of the schedule will also be used for cash flow projection purposes.
7. The cost-loading of each activity shall indicate the portion of the cost for that activity that is applicable to a specific bid item (cost account.) The total cost for each cost account must equal the bid item price.

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L. **NOT TO BE USED IN THE CONTRACTOR'S CPM SCHEDULE**

1. Milestones or constraint dates not specified in the Contract.
2. Scheduled work not required for the accomplishment of a Contract Milestone
3. Use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer.
4. Delayed starts of follow-on trades.
5. Float suppression techniques.
6. Leads such as leads, lags, SS, SF, & FF relationships without the expressed permission of the Department.

722.62 Submittal Requirements

All schedules shall be prepared and submitted in accordance with the requirements listed below.

Each monthly Contract Progress Schedule submittal shall be uniquely identified.

Each Submission shall, at a minimum, include the following:

a. Narrative
b. Schedule submittals shall be signed by the Scheduler
c. Schedule Printout - All Activities
d. Schedule Printout - Critical Path Layout
e. Schedule Printout - Remaining Work
f. Schedule Printout - Top 3 Float Path
g. Work Breakdown Structure (WBS) Summary
h. Project Spending Report (PSR) in Portable Document Format (.PDF)
i. Project Spending Report (PSR) in Microsoft Excel spreadsheet (.XLS)
j. Oracle Primavera P6 Schedule File (.XER)

All digital file submittals will be labeled with the following information.

- Contract Number
- Project Number
- Project locations (i.e., town(s))
- Brief description
- Submittal description (i.e., UP07)
- Data Date (MM-DD-YY)
- File Description (i.e., Critical Path)

Example: C110464 (P606309) - Orange Route 2 over 202 – UP23 (07-15-22) - Critical Path

A. **Narratives**

A written narrative shall be submitted with every schedule submittal. The narrative shall:

1. itemize and describe the flow of work for all activities on the Critical Path in a format that includes any changes made to the schedule since the previous Contract Progress Schedule / Monthly Update or the Baseline Schedule, whichever is most recent.
2. provide a description of any specification requirements that are not being followed. Identify those that are improvements and those that are not considered to be meeting the requirements.

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3. provide all references to any Notice of Delay that has been issued, within the time period of the Contract Progress Schedule Update, by letter to the Engineer. Note that any Notice of Delay that is not issued by letter will not be recognized by the Engineer. See Subsection 722.64.A – Notice of Delay.
4. provide a description of each third-party utility's planned vs. actual progress and note any that are trending late or are late per the durations and commitments as provided in the PUC Form; provide a description of the five (5) most important responses needed from the Department and the need date for the responses in order to maintain the current Schedule of Record.
5. provide a description of all critical issues that are not within the control of the Contractor or the Department (third party) and any impact they had or may have on the Critical Path.
6. provide a description of any possible considerations to improve the probability of completing the project early or on time.
7. compare Early and Late Dates for activities on the Critical Path and describe reasons for changes in the top three (3) most critical paths.
8. describe the Contractor's plan, approach, methodologies, and resources to be employed for completing the various operations and elements of the Work for the top three (3) most critical paths. For update schedules, describe and propose changes to those plans and verify that a Proposal Schedule is not required.
9. describe, in general, the need for shifts that are not 5 days/week, 8 hours/day, the holidays that are inserted into each calendar and a tabulation of each calendar that has been used in the schedule.
10. describe any out-of-sequence logic and provide an explanation of why each out-of-sequence activity does not require a correction, if one has not been provided, and an adequate demonstration that these changes represent the basis of how these activities will be built, including considerations for resources, dependencies, and previously approved production rates.
11. identify any possible duration increases resulting from actual or anticipated unit price item quantity overruns as compared to the baseline duration, with a corresponding suggestion to mitigate any possible delays to the Critical Path. If the delay is anticipated to impact the Critical Path, refer to Subsections 4.06 – Increased or Decreased Contract Quantities and 8.10 – Determination and Extension of Contract Time for Completion and submit a letter to the Engineer notifying of a potential delay.
12. include a schedule log consisting of the name of the schedule, the data date and the date submitted.
13. include and describe any notifications, communications and coordination meetings with third-parties such as utility companies that occurred from the last update including personnel names, job titles and contact information, date of meeting(s)/correspondence(s), topics discussed, and reasons the third party provided for deviations from the PUC form.

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B. **CPM Bar Charts**

One (1) timescaled bar chart containing all activities shall be prepared and submitted using a scale that yields readable plots and that meets the requirements of Subsection 722.61 – Schedule Content and Preparation Requirements Activities shall be linked by logic ties and shown on their Early Dates. Critical Paths shall be highlighted, and Total Float shall be shown for all activities.

A second timescaled bar chart shall also be prepared containing only the Critical Path or, if the Critical Path is not the longest path, the Longest Path using a scale that yields readable plots and that meets the requirements of Subsection 722.61 – Schedule Content and Preparation Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Total Float shall be shown for all activities.

C. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison (DASC) is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information. The DASC consists of an updated bar chart that overlays the current time period's bar chart onto the previous time period's bar chart for an easily read comparison of progress during the present and previous reporting periods.

D. Activity Cost Report and Monthly Cash Flow Projections (Type A only)

With each Contractor Quantity Estimate (CQE), the Contractor shall submit an Activity Cost Report and Cash Flow Projection that includes all activities grouped by Contract Bid Item.

The Activity Cost Report shall be generated from the Schedule of Record and shall be the basis of the Monthly Cash Flow Projection. Within each contract Bid Item, activities shall be sequenced by ascending activity identification number and shall show:

1. activity ID and description,
2. forecast start and finish dates for each activity and,
3. when submitted as a revised schedule, actual start, and finish dates for each completed activity.
4. any variance to the estimated contract quantity shall be shown.

E. Resource Graphs (Type A only)

Monthly and cumulative resource graphs for the remaining Contract period using the Early Dates and Late Dates in the Contract Progress Schedule shall be included as part of each schedule submittal.

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F. Projected Spending Reports

A Projected Spending Report (PSR) shall be prepared and submitted monthly. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. The Projected Spending Report (PSR) shall be depicted in a tabular format and provided in both an .XLS and .PDF.

722.63. Progress Schedule Requirements

A. Baseline Schedule

The Baseline Schedule shall be due thirty (30) Calendar Days after Notice to Proceed (NTP). The Baseline Schedule shall only reflect the Work awarded to the Contractor and shall not include any additional work involving Extra Work Orders or any other type of alleged delay. The Baseline Schedule shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements. Once the Baseline Schedule has been accepted by the Engineer, with or without comments, it shall represent the as-planned schedule for the Work and become the Contract Progress Schedule of Record until such time as the schedule is updated or revised under Subsections 722.63.C - Contract Progress Schedules / Monthly Updates, 722.64.C - Recovery Schedules and 722.64.D - Proposal Schedules.

The Cost and Resource-Loading information (Types A and B only) shall be provided by the Contractor within forty-five (45) Calendar Days after NTP.

The Engineer's review comments on the Baseline Schedule and the Contractor's responses to them will be maintained for the duration of the Contract and will be used by the Engineer to monitor the Contractor's work progress by comparing it to the Contract Progress Schedule / Monthly Update.

B. Interim Progress-Only Schedule Submissions

The first monthly update of the Contract Progress Schedule/Monthly Update is due within seventy (70) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule review period ends at sixty (60) Calendar Days after NTP, see Subsection 722.60.B - Schedule Reviews by the Department. If the Baseline Schedule has not been accepted within sixty (60) Calendar Days after NTP, an Interim Progress-Only Schedule shall be due within seventy (70) Calendar Days after NTP. The purpose of the Interim Progress-Only Schedule is to document the actual progress of all activities, including non-construction activities, from NTP until the Baseline Schedule is accepted.

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C. Contract Progress Schedules / Monthly Updates

The first Contract Progress Schedule shall be submitted by the Contractor no later than seventy (70) Calendar Days after NTP. The data date for this first Progress Schedule shall be two months (approximately sixty (60) Calendar Days) after NTP. Subsequent Progress Schedules shall be submitted monthly.

Each Contract Progress Schedule shall reflect progress up to the data date. Updated progress shall be limited to asbuilt sequencing and asbuilt dates for completed and inprogress activities. Asbuilt data shall include actual start dates, remaining Work Days and actual finish dates for each activity, but shall not change any activity descriptions, the Original Durations, or the Original Resources (as planned at the time of bid), without the acceptance of the Engineer. If any activities have been completed out-of-sequence, the Contractor shall propose new logic ties for affected in-progress and future activities that accurately reflect the previously approved sequencing. Alternatively, the Contractor may submit to the Engineer for approval an explanation of why an out-of-sequence activity does not require a correction and an adequate demonstration that the changes accurately represent how the activities will be built, including considerations for resources, dependencies, and previously approved production rates. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

No revisions to logic ties, sequence, description, or duration of future activities; or planned resource costs shall be made without prior approval by the Engineer.

Any proposed logic changes for in-progress or future activities shall be submitted to the Engineer for approval before being incorporated into a Contract Progress Schedule. The logic changes must be submitted using a Proposal Schedule or a schedule fragnet submission. Once approved by the Engineer, the Contractor may incorporate the logic in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

For any proposed changes to the original sequence, description or duration of future activities, the Contractor shall submit to the Engineer for approval an explanation of how the proposed description or duration change reflects how the activity will be progressed, including considerations for resources and previously approved production rates. Any description or duration change that does not accurately reflect how the activity will be progressed will not be approved by the Engineer. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

Contract Progress Schedules that extend performance beyond the Contract Time or beyond any Contract Milestone shall not be approved by the Engineer. The Contractor shall submit a Recovery Schedule, or a Time Entitlement Analysis, if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

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D. Short-Term Construction Schedule

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a spreadsheet format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule and may be at a greater level of detail. The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work for the two (2) week period prior and all planned work for the following three (3) week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities. Short-Term Construction Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements.

722.64 Impacted Schedule Requirements

A. Notice of Delay

The Contractor shall notify the Engineer in writing, with copies to the District and State Construction Engineers, within fifteen (15) of the start of any delays to the Critical Path that are caused by actions or inactions that were not within the control of the Contractor. Delay notifications that are not provided in a letter to the Engineer, such as a delay notification in the schedule narrative, will not be recognized as contractual notice in the determination of any Time Extension related to the impacts to the work associated with this specific alleged delay. Should such a delay continue for more than one (1) week, the Contractor shall note it in the Schedule Narrative until the delay is no longer impacting the Critical Path for the completion of the Contract Milestones. The Engineer will evaluate the alleged delay and its impact and will respond to the Contractor within ten (10) Calendar Days after receipt of a notice of delay.

B. Time Entitlement Analysis

A Time Entitlement Analysis (TEA) shall consist of a descriptive narrative, prepared in accordance with Subsection 722.62.A - Narratives, and an as-built CPM schedule, which may be in the form of a schedule fragnet that has been developed from the project's Contract Progress Schedule of Record, and illustrates the impact of a delay to the Critical Path, Contract Milestones and/or Contract Completion Date as required in Subsection 8.10 - Determination and Extension of Contract Time for Completion. TEAs shall also be used to determine the schedule impact of proposed Extra Work Orders (EWO) as also required in Subsection 8.10.

TEAs shall be prepared and submitted in accordance with the requirements of Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements and shall be based on the Contract Progress Schedule of Record applicable at the start of the delay or impact from an EWO. A TEA fragnet must start with a specific new activity describing the work contained in either a Notice of Delay previously submitted to the Department per Subsection 722.64.A - Notice of Delay or an EWO.

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TEAs shall be submitted:

1. as part of any Extra Work Order that may impact Contract Time,
2. with a request for a Time Extension,
3. within fifteen (15) Calendar Days after a request for a TEA by the Engineer for any other reason.

A TEA shall be submitted to the Engineer before any Time Extension is granted to the Contractor. Time Extensions will not be granted unless the TEA accurately reflects an evaluation of all past delays and the actual events that occurred that impacted the Critical Path. The TEA must also demonstrate a plan for the efficient completion of all of the remaining work through an optimized CPM Schedule. The analysis shall include all delays, including Contractor-caused delays, and shall be subdivided into timeframes and causes of delays.

TEAs shall incorporate any proposed activities, logic ties, resource considerations, and activity costs required to demonstrate the schedule impacts most efficiently in addition to detailing all impacts to existing activities, logic ties, the Critical Path, Contract Milestones, and the Contract Completion Date. In addition, TEAs shall accurately reflect any changes made to activities, logic ties, restraints, and activity costs, necessitated by an Extra Work Order or other schedule impact, for the completion of the remaining work. The Contractor shall provide TEAs that demonstrate that all delays have been mitigated to the fullest extent possible without requiring an Equitable Adjustment to the original bid basis.

All TEAs shall clearly indicate any overtime hours, additional shifts and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. The Engineer shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions if it is determined to be in the best interest of the Department to do so.

When accepted, the changes included in a TEA shall be incorporated into the next Contract Progress Schedule per the requirements of Subsection 722.63.C - Contract Progress Schedules / Monthly Updates. During the review of any TEA, all Contract Progress Schedules shall continue to be submitted as required.

The Engineer may request that the Contractor prepare a Proposal Schedule or a Recovery Schedule to further mitigate any delays that are shown in the accepted TEA or Contract Progress Schedule.

C. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Contract Progress Schedules that predict performance extended beyond the Contract Time or beyond any Contract Milestone shall not be approved as the schedule of record. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

The Contractor shall submit a Recovery Schedule within fifteen (15) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates unless a recovery schedule is waived by the Department. Waiving the recovery schedule does not relieve the contractor of the responsibility for the delay. The Department may revoke the waiver of a Recovery Schedule, at which time a Recovery Schedule shall be submitted within fifteen (15) Calendar Days of the Contractor being notified.

Changes represented in accepted Recovery Schedules shall be incorporated into the next Contract Progress Schedule.

SECTION 722 (Continued)

D. Proposal Schedules

A Proposal Schedule is an alternative schedule used to evaluate proposed changes to the Contract scope or significant alternatives to previously approved approaches to complete the Work, which may include changes to activity durations, logic, and sequence. For Types A and B Schedules, the Proposal Schedule shall be cost and resource loaded.

A Proposal Schedule may be requested by the Department at any time or may be offered by the Contractor. The Engineer may request that the Contractor prepare a Proposal Schedule to further mitigate any delays that are shown in an accepted TEA or Contract Progress Schedule.

The Contractor shall submit the Proposal Schedule within thirty (30) Calendar Days of a request from the Department.

The Proposal Schedule shall not be considered a Schedule of Record until the logic, durations, narrative, and basis of the Proposal Schedule have been accepted by the Engineer. If the Proposal Schedule took the form of a fragnet, it must be incorporated into the Contract Progress Schedule of Record showing the current progress of all other activities and the impacts/results of the changes made by the Proposal Schedule before the Proposal Schedule is accepted by the Department.

Proposal Schedules shall clearly indicate any proposed acceleration including overtime hours, additional shifts, and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. Proposal Schedules that contain a cost element shall be submitted with a separate Cost Proposal.

Changes represented in the accepted Proposal Schedules shall be incorporated into the next Contract Progress Schedule. During the review of any Proposal Schedule, all Contract Progress Schedules shall continue to be required every month.

E. Disputes

All schedules shall be submitted, reviewed, dispositioned, and accepted in the timely manner specified herein so as to provide the greatest possible benefit to the execution of this Contract.

The Contractor may dispute a decision by the Engineer by filing a claim notice within seven (7) days after the Contractor's request for additional time has been denied or if the Contractor does not accept the number of days granted in a time extension. The Contractor's claim notice shall include a revised time entitlement analysis that sufficiently explains the basis of the time-related claim. Failure to submit the required time entitlement analysis with the claim notice shall result in denial of the Contractor's claim. A determination on the Contractor’s claim shall be in accordance with Subsection 7.16 Claims of Contractor for Compensation. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

SECTION 722 (Continued)

722.65 Schedule Type D Requirements

This section is to detail the requirements for Type D Schedules and is separate from the requirements listed above. These schedules are intended for a project in which a more formal schedule would not be practical.

Schedules for Type D projects shall be submitted for each work assignment. The Schedule Type D shall be submitted electronically in .XLS and .PDF format and meet the following requirements.

The schedule requirements for work assignments that are anticipated to last three weeks or less shall conform to the requirements for Short-term Construction Schedules below.

Work assignments that are anticipated to last longer than three weeks shall submit a bar chart baseline and provided update schedules upon request of the engineer as required under Bar Chart Schedule below in addition to meeting the Short-term Construction schedule requirements.

A. **Bar Chart Schedule**

A Bar Chart that shall include the following:

- Work Assignment start date.
- Activities to identify.
  - Major work operations broken down to be no longer than 14 days.
  - Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before procuring and fabricating.
  - The preparation and submission of shop drawings, procedures, and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable.
  - The review and return of shop drawings, procedures, and other required submittals, approved or with comments, the duration of which shall be shown as thirty (30) Calendar Days,
  - Detailed activities to satisfy permit requirements.
  - Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
  - Project Close out activities including a 21-calendar day creation of a punchlist activity and 30 calendar day minimum completion of punchlist activity.
- Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third-party work affecting the Contract.
- Access Restraints – restrictions on access to areas of the Work
- Traffic work zone set-up and removal, night work and phasing
- Contract Milestones including Full beneficial Use, Substantial Completion and Contractor Field Completion

The Bar Char Schedule shall be provided at the beginning of the project and updated with each work order created for the project.

SECTION 722 (Continued)

B. **Short-Term Construction Schedule**

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a spreadsheet format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule and may be at a greater level of detail. See schedule toolkit for suggested format.

The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work on the assignment for the two week period prior and all planned work for the following three week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities.

C. **Project Spending Report (PSR)**

A Projected Spending Report (PSR) shall be prepared and submitted monthly. The PSR shall be for all active work assignments, broken down by work assignment. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. The Projected Spending Report (PSR) shall be depicted in a tabular format and provided in both an .XLS and .PDF

SECTION 722 (Continued)

COMPENSATION

722.80 Method of Measurement

Schedule of Operations (Type A, B and C)

The project bid documents specify the fixed-price amounts to be paid to the Contractor for the Project Schedule requirements contained herein. Each bidder shall include this fixed price bid item amounts in their bid. Failure to do so may be grounds for the rejection of the bid.

This fixed price amount is for payment purposes only and is separate from what the Department considers to be the Contractor's General Condition costs. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor's overall bid price.

All required schedule-related work, including, but not limited to computers, computer software, the planning and coordination with utilities, training, schedule preparation and schedule submittals will be paid for under the fixed price amount.

Twenty percent (20%) of this pay item will be paid upon the Engineer's acceptance of the Contractor's Baseline Schedule, prepared and submitted in accordance with Subsection 722.63.A.

The remaining eighty percent (80%) of this pay item will be paid in equal monthly installments distributed across the Contract Duration from Notice to Proceed (NTP) to Contractor Field Completion (CFC), less the 2 months required for the submittal and review of the Baseline Schedule in accordance with the following formula:

$$\text{Monthly Payment} = \frac{\text{Remaining Fixed Price amount (80\% of the Item Cost.)}}{\text{Contract Duration in whole months} - 2 \text{ months}}$$

The Schedule of Operations pay item will be adjusted to pay for only the actual quantity of schedules that have been submitted in accordance with this section.

Should there be a Time Extension granted to the Contractor, the Engineer may provide an Equitable Adjustment for additional Contract Progress Schedule Updates at intervals directed by the Engineer. The monthly payment will be the basis for this Equitable Adjustment.

Schedule of Operations (Type D)

For projects assigned with Type D schedule requirements, all scheduling work shall be considered incidental to the project with no separate payment under this section.

SECTION 722 (Continued)

722.81 Basis of Payment

The timely and accurate submission of the Baseline Schedule is critical to the Contract and the Department's ability to make informed decisions. Only payments under Item 740 - Engineer's Field Office and Item 748 – Mobilization will be made until the Baseline Schedule is accepted by the Engineer.

All required schedule-related work, including, but not limited to computers, computer software, the planning and coordination with utilities, training, schedule preparation and schedule submittals (including monthly progress schedules, short-term schedules, project spending reports, TEAs, recovery schedules or impacted schedules) shall be included in this work.

No payment for any other pay item will be processed beyond seventy-five (75) Calendar Days from Notice to Proceed (NTP) until the Baseline Schedule is accepted by the Engineer. Until the Engineer's acceptance of the Baseline Schedule, the combined total of all payments made to the Contractor will be limited to an amount no greater than the total price for Item 748 - Mobilization or 3% of the contract price, whichever is less.

All Contract Progress Schedule Updates submitted later than ten (10) Calendar Days after the CQE (Contract Quantity Estimate) completion date, or greater than forty (40) Calendar Days from the Data Date of the previous submission, will be deemed to be no longer useful and will not qualify for payment. The late submission of Impacted schedules, including TEAs, recovery schedules and proposal schedules will result in the forfeiture of the monthly payment for the month in which they were due and subsequent months until the submission is made. Late submission of missed submittals will not result in recovery of the previously forfeited portion of the Schedule of Operations Fixed Price Payment Item.

Failure to submit schedules as and when required may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

Failure to submit schedules that are acceptable to the Engineer may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

The Schedule of Operations pay item will be adjusted to pay for only the actual quantity of schedules that have been submitted in accordance with this section.

The Contractor's failure or refusal to comply with the requirements of this Section shall be reasonable evidence that the Contractor is not prosecuting the Work with due diligence and may result in the Engineer withholding of full or partial payments of all work performed.

722.82 Payment Items

722.1	SCHEDULE OF OPERATIONS (TYPE A) - FIXED PRICE $_____	LUMP SUM
722.2	SCHEDULE OF OPERATIONS (TYPE B) - FIXED PRICE $_____	LUMP SUM
722.3	SCHEDULE OF OPERATIONS (TYPE C) - FIXED PRICE $_____	LUMP SUM

ITEM 100.9 PRE-CONSTRUCTION SURVEY AND VIBRATION MONITORING OF HISTORIC HOUSES **LUMP SUM**

The work under this item shall include performing a pre-construction survey of (5) historic houses adjacent to the project area. The locations include #04 Hastings St., #06 Hastings St., #08 Hastings St., #10 Hastings St., and #23 Maple St., which are listed in the National Register of Historic Places as contributing properties within the Mendon Historic District. Included under this item is vibration monitoring of the houses both prior to and during construction and performing pre-construction video inspections of the basement walls and visible foundation.

Prior to starting any work, the following pre-construction requirements shall be followed by the Contractor. A copy of these requirements must be provided to the Engineer and provided to the property owners.

PRE-CONSTRUCTION REQUIRMENTS

The standard operating procedure shall ensure the following:

1. Contractor to provide pre-construction photography immediately upon the commencement of construction activities.
2. All (5) historic property owners will be contacted in advance by certified mail and copies of letters must be provided to the Engineer. Letter to include description of work activities involved under Item 100.9 as well as the Contractor's contact information.

CONSTRUCTION METHODS

1. Building Survey

The Contractor shall retain and pay an experienced Professional Engineer registered in the Commonwealth of Massachusetts to perform a pre-construction survey of the five historic houses. The Contractor shall contact the Director of Planning and Development, Town of Mendon for contact information for the houses. The purpose of the survey shall be to document the pre-construction condition of those houses. This survey, as a minimum, shall locate, measure, photograph and otherwise document any visible cracks, defects, distortion, settlement, and other signs of distress in each historic house prior to construction. The product shall be five separate reports, one for each house. Each report shall be an original written report stamped and signed by the Engineer performing the survey and four (4) copies, including photographs, DVD's, plans, sketches and attachments, which shall be submitted to the Engineer a minimum of five (5) days prior to commencement of any construction activities on Hastings St. or Maple St. that might affect those properties. Copies of the report, either hard copy or electronically, as preferred, shall be distributed to the MassDOT Resident Engineer, the Contractor, Town of Mendon Director of Planning and Development, and the respective property owner. A cover letter shall be included with the reports, containing contact information for the MassDOT Resident Engineer.

ITEM 100.9 (CONTINUED)

2. Building Vibration Monitoring

The Contractor shall install one seismograph in the lowest level of each of the five historic houses prior to the start of construction. The seismograph shall be located on the lowest working level of the structure. The exact location shall be coordinated with the Owner(s). The Contractor shall submit a vibration monitoring plan listing all required equipment and showing its proposed location within the structure. The plan shall also describe the monitoring procedures to be followed. Copies of the plan, either hard copy or electronically, as preferred, shall be distributed to the Resident Engineer, the Contractor, and the respective property owner. This plan shall be submitted not less than fifteen (15) days prior to the commencement of the baseline monitoring period. The seismograph shall have the following minimum features:

- Seismic range: 0.01 to 4 inches per second with an accuracy of +/- 1-5 percent of the measured peak particle velocity or better at frequencies between 10 Hertz and 100 Hertz, and with are solution of 0.01 inches per second or less.
- Three channels for vibration monitoring.
- Two power sources: internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibrations continuously for up to 24 hours.
- Instruments must be capable of producing strip chart recordings and readings on site within one hour of obtaining readings. Provide computer software to perform analysis, produce reports of continuous monitoring.
- Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of one minute or less.

Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer calibration requirements and that, where applicable, calibrations are traceable to the National Institute of Standards and Technology.

The Contractor shall operate the seismograph for a minimum of five (5) consecutive 24-hour periods prior to the start of construction to establish baseline levels. Copies of the report summarizing the recorded baseline levels shall be distributed as outlined previously a minimum of five (5) days prior to commencement of any construction activity.

Following the start of construction the Contractor shall monitor the vibration levels on an ongoing basis during the following activities: pavement milling, resurfacing, and shared use path construction on Hastings St. between Maple St. and Main St. or other activities as required by the Engineer. The Contractor shall maintain records of the vibration levels and shall submit a report of these levels as requested by the Engineer. The threshold value for peak particle velocity vibration criteria shall be 12.7 millimeters per second (1/2-inch per second). If measurements exceed the threshold value, the following actions shall be taken:

1. Verify measurement reading.
2. Double the frequency of readings.

ITEM 100.9 (CONTINUED)

3. Notify the Engineer. Hold a meeting with representatives of the Contractor and MassHighway. Ensure work is being performed in accordance with the Contract Documents. Meeting to be held within 48 hours of exceeding the threshold value.

The limiting value for peak particle velocity vibration criteria shall be 25.4 millimeters per second (1-inch per second).

If measurements exceed the limiting value, the following actions shall be taken:

1. Stop construction operations immediately.
2. Verify measurement reading.
3. Notify the Engineer, The Mendon Historic Commission and the Cultural Resources Unit. Hold a meeting with representatives of the Contractor and MassDOT immediately.
4. Inspect buildings in the vicinity of where the limiting value has been measured.

Based on the level of damage identified, follow the directions outlined below:

a. No Damage to Slight damage (as defined by Boscardin and Cording); Proceed with construction operations while monitoring the condition of the building. Monitoring shall be continuous during the hours that construction operations are being performed. If building damage is noted to reach the Moderate level (as defined by Boscardin and Cording) during the monitoring, stop construction activity. Proceed to b.
b. Moderate to severe damage (as defined by Boscardin and Cording); Install preventative measures to prevent further damage to the building before proceeding with construction activity. Preventative measures may include underpinning the building, and/or building frame supplementary support/stabilization. The Contractor, MassHighway, the Town of Mendon, the Mendon Historic Commission and the affected property owner must all approve the proposed additional measure before the measure is implemented. Once the measure is implemented, proceed with construction operations while monitoring of the condition of the building. Monitoring shall be continuous during the hours that construction activity is being performed. If additional damage is noted, stop construction activity, and repeat the above procedure relative to additional preventative measures.

During all monitoring of vibration-producing construction activities the Contractor shall document all events that are responsible for the measured vibration levels, and submit the documentation to the Engineer with the data.

ITEM 100.9 (CONTINUED)

CLASSIFICATION OF VISIBLE DAMAGE

Class Of Damage	Description of Damage (a)	Approximate Width of Cracks, m (b)
Negligible	Hairline Cracks	< 0.1
Very Slight	Fine cracks easily treated during normal redecoration. Perhaps isolated slight fracture in building. Cracks in exterior brickwork visible upon close inspections	< 1
Slight	Cracks easily filled. Re-decoration probably required. Several slight fractures inside building. Exterior cracks visible, some repointing may be required for weathertightness. Doors and windows may stick slightly.	< 5
Moderate	Cracks may require cutting out and patching. Recurrent cracks can be masked by suitable linings. Tuck pointing and possibly replacement of a small amount of exterior brickwork may be required. Doors and windows sticking. Utility service may be interrupted. Weathertightness often impaired.	5 to 15 or several cracks > 3mm
Severe	Extensive repair involving removal and replacement of sections of walls, especially over doors and windows require. Windows and door frames distorted, floor slopes noticeably/ Walls lean or bulge noticeably, some loss of bearing in beams. Utility service disrupted.	15 to 24 also depends on number of cracks.
Very Severe	Major repair involving partial or complete reconstruction. Beams lose bearing, walls lean badly and require shoring. Windows broken by distortion. Danger of instability.	Usually > 25 Depends on number of cracks

ITEM 100.9 (CONTINUED)

The Contractor shall coordinate with the Engineer and the (5) property owners to schedule the facility survey and to establish the location of the seismograph (a) Location of damage in the building or structure must be considered when classifying degree of damage.

Crack width is only one aspect of damage and should not be used on alone as a direct measure of it.

BASIS OF PAYMENT

Item 100.9 PRE-CONSTRUCTION SURVEY AND VIBRATION MONITORING OF HISTORIC HOUSES will be paid at Contract Bid Unit Price per LUMP SUM in full compensation for all labor, transportation, materials, equipment and expertise required to complete the work, to be paid with the following breakdown:

A sub-total of fifteen percent (15%) of the Lump Sum price will be paid at a pro-rated basis as the 5 (five) individual reports are submitted upon verification, approval and acceptance by the Engineer.
The remaining (85%) will be paid at a pro-rated basis on monitoring of the vibration of the 5 (five) buildings and reporting the damage as the work progresses.

ITEM 102.3 HERBICIDE TREATMENT OF INVASIVE PLANTS HOUR

This work must be performed by persons who meet the qualifications below and are approved by the Landscape Design Section.

Work under this item consists of herbicide treatment of invasive plants currently existing within the project limits and as directed. An Invasive Plant Management Strategy (IPMS) shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on-site. The IPMS shall be written and submitted per Item 102.33 Invasive Plant Management Strategy and shall be measured and paid for under that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Payment is per hour on-site and shall be compensation for a minimum crew of 2 licensed applicators, 2 back-pack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work. If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

Date and time stamped photos indicating start and stop time of work must be submitted if requested.

This item is not intended for manual removal of plants.

Management of plants determined to have been introduced to the site via imported loam, compost, mulch, plants, equipment, or other construction activities will be the Contractor's responsibility and at the Contractor's expense.

Herbicide shall be applied during daytime hours only.

Measures to prevent the introduction of invasive plant species to the site and to address introduction due to construction-related activities shall be covered under the Standard Specifications, Division I - Subsections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions.

Plant species targeted for management under this item shall be as determined in the field per the site walk and as specified in the IPMS.

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): "non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems."

ITEM 102.3 (CONTINUED)

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may, upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IMPS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer and a MassDOT Landscape Architect. Contact at MassDOT Landscape Design Section may be contacted at: tara.mitchell@dot.state.ma.us

QUALIFICATIONS

The applicators shall submit and meet the qualifications outlined below. A list of contractors specializing in invasive management and approved by MassDOT Landscape Design Section is available on the following website: https://www.mass.gov/lists/landscape-design-and-roadside-maintenance under Invasive Plant Management.

Requirements

1. Company must provide proof of qualifications by providing the following:
    a. Narrative describing company, its expertise and experience with invasive plant control.
    b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas.
    c. Describe company's technical qualifications and past performance.

2. Company must meet licensing requirements:
    a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
    b. At least one or more applicator must have a ROW certification, if required for work.
    c. Company must provide name(s) of applicator(s) and Applicator License/Certification number for all contractor crew leaders working on the project.
    d. Company must provide documentation of any warnings, penalties or fines received in the last three (3) years.

3. Company must provide proof of experience with invasive plant control and include following:
    a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
    b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include summary of equipment used.
    c. Photo documentation of these projects.
    d. GPS coordinates of project locations, if available.

4. Crew leader must have expertise with invasive plant control and provide the following:
    a. Have held Core license for at least five (5) years.

ITEM 102.3 (CONTINUED)

b. Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management.

SUBMITTALS

No work shall begin without approval of the submittals.

Submittals include the following items:

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect. All chemicals, methods and work done under this item shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

Herbicide Use Report

Within two (2) weeks after each application, the Contractor shall provide to the Engineer and the MassDOT Landscape Architect a completed and signed MassDOT Herbicide Use Report.

Photo Documentation

Digital photos with date and time of herbicide application work, showing start time and completion time, are required and must be submitted for measurement of payment upon request.

MATERIALS

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on herbicide proposed and shall be per the manufacturer's label for specific application.

METHODS

All methods used shall be as approved in the IPMS which shall be determined during the Initial Site Walk as described under Item 102.33 Invasive Plant Management Strategy.

The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

The Contractor shall notify the Engineer a minimum of 3 days prior to date of expected herbicide application. Applicators shall notify the Engineer upon arriving on-site and upon leaving the site.

ITEM 102.3 (CONTINUED)

Herbicide Applications

All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

Contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

Contractor is responsible for any damage to vegetation not designated for removal or treatment. Vegetation damaged shall be restored. Cost of replacement plants and/or restoration shall be borne by the Contractor.

Contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

Disposal Of Invasive Plant Material

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material must be approved by the Engineer and included in the IMPS.

For plant material taken to an incinerating facility per the IPMS, a receipt from that facility shall be submitted to the Engineer as proof of disposal.

ITEM 102.3 (CONTINUED)

Where feasible, it is preferable to dispose of plants on-site or to bury them on-site with on-going monitoring for re-sprouting. Disposal locations and methods must be approved and included in the IPMS. Site work such as grading and seeding to stabilize and restore disposal area shall be incidental to this item.

The Contractor shall be responsible for treating or otherwise managing areas of re-growth due to improper disposal. Treatment shall be at the Contractor's expense.

Follow-Up Treatment

Plants and areas shall be re-treated as necessary and as appropriate to the time of year. Treatment shall be for the duration of the contract and per the IPMS.

MEASURE OF SUCCESS

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

METHOD OF MEASUREMENT

Item 102.3 will be measured for payment by the Hour of verified crew time spent on the project doing herbicide application as and where specified herein and in the IPMS. A crew shall be defined as a minimum of two licensed applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work.

BASIS OF PAYMENT

Item 102.3 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment will be based upon verified time spent on the project doing herbicide application as and where specified in the IPMS and upon receipt and approval of submittals. Payment will not include travel time to and from the Contractor's place of business and nor time for investigative field trips.

If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

The Invasive Plant Management Strategy will be paid for under Item 102.33.

ITEM 102.33 INVASIVE PLANT MANAGEMENT STRATEGY HOUR

This item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants currently existing on the project site and/or as directed and shall be coordinated with Item 102.3 Herbicide Treatment of Invasive Plants. Unless otherwise approved, the IPMS shall be submitted in the form of the MassDOT Invasive Plant Management Strategy Report Form.

The IPMS shall be submitted for review and approval by the MassDOT Landscape Design Section or their representative, and the IPMS shall be implemented on-site.

The Invasive Plant Management Strategy Report Form is available online at https://www.mass.gov/lists/landscape-design-and-roadside-maintenance under Invasive Plant Management.

Herbicide treatment for invasive plants shall be as described under Item 102.3 Herbicide Treatment of Invasive Plants and shall be compensated per that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation as relevant to the project.

Individual attending the site walk and determining the Invasive Plant Management Strategy must demonstrate expertise with vegetation management and invasive plant control and submit qualifications as described below.

QUALIFICATIONS

Individual shall be from the same company as that providing services for Item 102.3 Herbicide Treatment of Invasive Plants and shall submit the following, if not submitted under Item 102.3:

- Submit copy of current Core license.
- Submit a resume listing five (5) or more years of experience managing invasive plants with a company specializing in vegetation management.
- References shall be submitted if requested.

SUBMITTALS

Task Summary & Reports

For measurement of payment, the contractor shall submit the total sum and a breakdown of hours for the tasks performed. At a minimum, the tasks shall include the Initial Site Walk, submittal of an approved IPMS, and if requested to accommodate project or site changes, a Follow-up Site Inspection and accompanying IPMS Amendment.

Interim Site Monitoring Reports and/or a Final Report shall be submitted if requested by the MassDOT Landscape Design contact. The MassDOT Landscape Design contact must be notified to attend the site inspection walk when an Interim or Final Report has been requested. \

ITEM 102.33 (CONTINUED)

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to construction activities and/or any proposed treatment, the contractor shall submit the IPMS for approval by the Engineer and MassDOT Landscape Architect. All chemicals and methods proposed shall be consistent with applicable Massachusetts Wetlands Protection Act Order of Conditions.

The IPMS shall be completed in coordination with the Prime Contractor and the Engineer and shall include the following as appropriate and applicable to the project and to the IPMS Report Form questions and Guidance:

I. Project Information

a. Company writing the IPMS and performing the herbicide application.
b. Date of site walk
c. Attendees at site walk
d. Expected end date of contract and expected last treatment (month/season)

II. Brief Description of Conditions

a. Provide a free-hand sketch on construction plans or aerial image showing species, location, and as relevant, show or note extent of population as relevant to Strategy (i.e., population extends off ROW preventing eradication, small population and eradication deemed feasible within contract schedule, etc.).

III. Coordination with Roadway Contractor regarding other work

a. Tree Work: Note coordination to be implemented with tree removal, clearing, and clearing and grubbing as applicable to the project.
b. Wetland Mitigation - Include management proposed for wetland mitigation areas in the IPMS, if and as required.
c. Planting: If there will be planting in areas proposed for treatment, propose treatment and schedule to avoid herbicide damage to plants.
d. Mowing: If coordination is required with state mowers, note need in IPMS.

IV. Soil Management

a. Provide specifics on how soil with invasive plant roots (in particular) or seeds will be handled (i.e., separate stockpiles, plant material will be buried on-site, re-used on-site, disposed off-site and if so, where?).
b. Show stockpile locations on plan and include treatment schedule.
c. Note measures that will be implemented to avoid spread through equipment, including how and where equipment will be cleaned.

V. Invasive Plant Treatment & Management

a. Proposed chemical and methods of treatment for each species or area.
b. Time of treatment based on target plant species.
c. Submit product label including application methods and rates (entire MSDS information need not be submitted if available online).

ITEM 102.33 (CONTINUED)

d. Proposed performance metrics or measure of treatment success if different from that specified under Item 102.3.
e. Method for disposing invasive plant material. This includes material that may result in spread (i.e., seeds, roots) and material that has been treated and/or is not viable (foliage, dead wood, etc.). Methods may include grinding in place, stockpiling and treating, and incinerating offsite.
f. Expected follow-up treatment for duration of contract.

VI. Monitoring Schedule if requested by MassDOT.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide an approved IPMS may jeopardize this item, in which case, the contractor will be responsible for management of invasive plants found on-site at no cost to the contract.

Photo Documentation

Digital photos of site conditions, typical species, and extent of infestation must be provided with the IPMS and with any follow-up monitoring or reporting. Photos of follow-up monitoring and reporting must be date and time stamped for acceptance.

METHODS

Initial Site Walk

Prior to any construction activities and soil disturbance, the Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect to determine the IPMS. During the site walk the Contractor shall identify limits of work and, as necessary, mark locations of areas designated for treatment and individual plants targeted for treatment or removal. The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

IPMS Follow-up Amendment

The IPMS may be amended to address additional concerns or adjust to conditions if required by the MassDOT Landscape Architect. The amended IPMS shall be submitted to the Engineer and MassDOT Landscape Architect for approval at least fourteen (14) days prior to any proposed treatment.

Interim Site Monitoring Inspection Reports

If required by the MassDOT Landscape Architect and Engineer, Interim Site Monitoring and an accompanying report shall be conducted. Interim Reports must include time and date stamped photos showing treated locations and species.

ITEM 102.33 (CONTINUED)

Final Inspection

A final inspection and report documenting the status of the invasive control may be required for regulatory purposes or for instances where control will be continued by others. The report shall include photo documentation of pre-construction (existing) and post-treatment conditions, notations on a plan or aerial image of area treated, summary of treatment performed, and control achieved. Final reports submittal must include time and date stamped photos.

METHOD OF MEASUREMENT

Item 102.33 will be measured for payment by the Hour. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal and acceptance of submittals and photos described above.

BASIS OF PAYMENT

Item 102.33 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work. Payment shall not include travel time to and from the Contractor's place of business.

ITEM 102.511 TREE PROTECTION – ARMORING AND PRUNING EACH

The work under this item shall conform to the relevant provisions of Sections 771 of the Standard Specifications and the following:

Tree protection – armoring and pruning shall be used for instances where construction activity (the use of heavy equipment), comes within proximity to potentially damage tree trunk(s) or limbs.

The work shall include the furnishing and installing of temporary tree trunk protection, minor limb pruning, or removal of lower tree limbs to prevent injury to the tree from construction equipment and activities; as shown on the Drawings; and/or as required by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

MATERIALS

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Material used for trunk armoring or mounting shall be such that installation and removal shall not damage the trunk.

Acceptable trunk armoring materials shall include two by four (2x4) wood cladding, mounted with wire or metal strapping, or when duration of construction activities is less than three months, slotted corrugated plastic pipe, mounted with duct tape. Eight (8) once untreated burlap shall be used to wrap the tree trunk prior to installation of cladding.

Alternative armoring methods or materials may be acceptable if approved by the Engineer.

The height of tree trunk cladding shall be measured from the base of the tree (including root flare) to the bottom of the first branch, or to a height of eight (8) feet, or as may be required by the Engineer.

METHODS OF WORK

Prior to construction activities, the Engineer, Contractor, and the Arborist (if item is included in the contract), shall review trees noted on the Drawings to be protected. Final decision and selection of trees to be armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be maintained such that it is effective for as long as required or replaced when materials are found to be damaged or ineffective, as determined by the Engineer. Replacement, if required, shall be incidental to the work. Armoring shall be removed immediately upon completion of work activities adjacent to the protected tree(s). Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

ITEM 102.511 (Continued)

DAMAGES OR LOSS

If trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense, secure the services of an Arborist, described in Item 102.55. The Arborist shall be approved by MassDOT.

If, based on the recommendation of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury; soil compaction remediation; pruning; soil injection fertilization; and/or watering; the damage shall be repaired as soon as possible, within the appropriate season for such work and according to industry standards.

If, based on the recommendation of the Arborist, the Engineer determines that damages are irreparable, or that the damages are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil. Such tree removal(s), grinding, debris removal, and topsoil filling, shall be at the Contractor's expense.

Tree removal from improper or inadequate tree protection shall result in the Engineer assessing the Contractor monetary damages consistent with industry standards for assessed value and/or replacement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per EACH tree to be armored and pruned. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract or as required by the Engineer.

Payment for work under this item will be scheduled as follows:

- 40% of the value shall be paid upon installation of trunk armoring and completion of pruning work, if required.

- 60% of the value shall be paid at the end of construction operations that would potentially damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

No separate payment will be made for costs of remedial actions, including Arborist services, tree removal, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

ITEM 102.513 AIR EXCAVATION AND ROOT PRUNING FOOT

Item 102.513 Air Excavation and Root Pruning is for the services of excavating soil with an air pressure tool in order to expose tree roots, and for associated services and materials necessary to complete the work of pruning, backfilling with existing soil, watering, mulching, and fertilizing. This item shall include the furnishing and operating the air excavating tool.

Associated Item: All references to Arborist herein shall refer to the Arborist under Item 102.55 Arborist. Arborist shall meet the requirements as specified under that Item and shall be compensated under that Item.

Trees to be air spaded shall be those shown on the plans and/or as determined necessary by the Engineer per the recommendations of the Arborist.

REFERENCES

The standards from American National Standards Institute (ANSI): A300 (Part 8)-2013 Root Management with special attention to Section 84 shall apply to this work. If requested, the Contractor shall provide to the Engineer one copy of this reference. Provision of reference shall be incidental to this item.

METHODS

Air excavation and pruning work shall be performed by or overseen by the Arborist.

Air excavation of soil and root pruning shall occur any time prior to equipment work within the root zone of marked trees.

Air excavation shall be done along the limit of proposed excavation. Trench shall be of sufficient width to observe and cut roots and shall be to the depth of proposed excavation. Immediately following air excavation, roots shall be pruned.

Following pruning, roots shall immediately be fully covered with backfill and immediately watered. Roots shall continue to be watered and fertilized as directed by the Arborist.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.513 will be measured and paid per foot where air spading, pruning, watering, and fertilizing are performed. This item will include full compensation for all labor, equipment, materials, and incidentals required for the satisfactory completion of the work.

Arborist services shall be per Item 102.55 Arborist and compensated under that Item.

ITEM 102.521 TREE AND PLANT PROTECTION FENCE FOOT

The work under this Item shall conform to the relevant provisions of Sections 644 and 771 of the Standard Specifications and the following:

Work under this item shall consist of furnishing, installing, and maintaining tree and plant protection fence(s) in a vertical and taut position; removing and resetting fencing as may be required; and final removal of protection fence(s) at the completion of construction activities, or as otherwise required by the Engineer.

The purpose of the fencing is to signify a construction work-free zone and physical barrier, thereby preventing damage to tree roots, tree trunks, soil, and all other vegetation within this delineated Tree and Plant Protection Zone (TPPZ), as shown on the Drawings, as required by the Engineer, and as described herein.

Protection shall be for the duration of the construction activities unless otherwise required by the Engineer.

MATERIALS

Tree and plant protection fence(s) shall provide a minimum forty-eight (48) inch tall barrier, that remains vertical and taut. The Fence shall be orange plastic safety fence (recommended where high visibility is necessary), or wooden snow fencing, or other approved material. Posts and anchoring materials shall be incidental to the work.

Per requirements of the Engineer, additional posts, deeper post depths, and/or additional attachments shall be used if the fabric or fence sags, leans or otherwise is not providing visible or physical protection to the TPPZ.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1, Pruning and Part 5, Construction Management Standard. Provision of reference shall be incidental to this item.

ITEM 102.521 (Continued)

Establishment of THE TPPZ

Fencing shall be used to delineate and establish the TPPZ, adjacent to construction areas, staging areas, stockpile areas, as shown on the Drawings, and/or as required by the Engineer.

Fencing shall be located as close to the work zone limit and as far from tree trunk(s) and plants as possible to maximize the area to be protected. Fence shall run parallel and adjacent to construction activity to create a barrier between the work zone and the root zone or designated limit of plants and soils to be protected.

When construction activities surround (or have the potential to surround) trees or plants to be protected, a circular enclosure shall be used. In these instances, the TPPZ limit shall be the drip line of each tree or as close as possible to the drip line, and/or as shown on the Drawings. The drip line is defined as the outermost limit of tree canopy.

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer. Activities may including operating, moving, or storing equipment, supplies, or materials; and locating temporary facilities, including trailers or portable toilets, Accessing or traversing the TPPZ shall not be permitted.

METHOD OF WORK

TPPZ fencing shall be installed prior to any construction work or staging activities. Fence(s) shall be repositioned where and as necessary for optimum tree and plant protection. Repositioning shall be incidental to this item. TPPZ fencing shall not be moved without prior approval by the Engineer.

The TPPZ shall be protected at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves, and roots of all plants; and contamination of the soil with construction materials, debris, silt, fuels, oils, and any chemicals substance.

After construction activities are completed, or when required by the Engineer, fencing, stakes, and other anchoring materials, if any, shall be removed and disposed off-site by the Contractor.

REQUIRED WORK WITHIN THE TPPZ

In the event that grading, trenching, utility work, or storage is unavoidable within the TPPZ, the Engineer shall be notified. Measures may be required for tree protection and preservations, including air spading; the use of six (6) inch depth of wood chips or approved matting for root protection; pruning of branches; and/or trunk protection. These protection measures shall be paid under applicable contract items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. Where handwork is not feasible, with permission of the Engineer, work shall be conducted with the smallest mechanized equipment necessary.

ITEM 102.521 (Continued)

TREE AND PLANT INJURY OR LOSS

If the TPPZ is encroached by construction activity without approval, at the discretion of the Engineer, the Contractor may be required to provide a more durable barrier (e.g., Jersey Barriers, chain link fence (if not already in use) to secure the area. Costs of furnishing and installing additional or more durable barrier(s) shall be borne by the Contractor.

In such cases of encroachment, soils shall be considered compacted and tree root injury will be assumed. Action shall be taken as specified below.

In the event that trees designated for protection under this item are injured, including root injury from unapproved trespassing onto the root zone, the Contractor shall, at his own expense, secure the services of an Arborist, described under Item 102.55. The Arborist shall be approved by MassDOT.

In the event of spills, compaction or injury, the Contractor shall take corrective action immediately using methods approved by the Engineer, in coordination with the Arborist.

If, based on the recommendations of the Arborist, the Engineer determines that injuries can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering; the injury shall be repaired as soon as possible, within the appropriate season for such work, and according to industry standards.

If, based on the recommendations of the Arborist, the Engineer determines that injuries are irreparable, or that the injuries are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil. Such tree removal(s), grinding, debris removal, and filling, shall be at the Contractor's expense.

Tree removal from improper or inadequate protection of the TPPZ shall result in the Engineer assessing the Contractor monetary damages consistent with industry standards for assessed value and/or replacement.

Shrubs removals from improper or inadequate protection of the TPPZ shall be replaced with plants of similar species and equal size or the largest size plants reasonably available. The Engineer shall approve the size, quality, and quantity of the replacement plant(s). Each replacement shall include a minimum of one year of watering and establishment care, specified under Section 771.

ITEM 102.521 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Tree and Plant Protection Fence will be measured by the FOOT, complete in place, by the length along the top of the fence.

Tree and plant protection fence will be paid for under the contract unit price per FOOT, complete in place and shall include all materials, labor, and equipment required to furnish, install, anchor, maintain, and remove the fence upon completion, as described herein. Posts, temporary footings, anchoring and removal upon completion, shall be incidental to this item.

No separate payment will be made for costs of remedial actions, including addition of more durable barriers, Arborist services, tree or plant removal, shrub replacement and establishment, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

Payment for work under this item will be scheduled as follows:

- Forty (40) percent of the value payment will be made upon installation of fencing.

- Sixty (60) percent of the value payment will be made when fencing materials have been maintained to function as specified, for the intended duration, and removed and disposed off-site at the completion of protection measure requirement.

ITEM 102.55 ARBORIST HOUR

DESCRIPTION

The work under this Item is for the services of a Certified Arborist. Arborist shall be an International Society of Arboriculture (ISA) Certified Arborist or a Massachusetts Certified Arborist. The Arborist shall have at least 10 years of experience in tree care, including tree protection during construction, and shall demonstrate a familiarity with the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1Pruning, Part 5 Construction Management Standards, and Part 9 Tree Risk Assessment.

The Arborist's general responsibilities include protecting high priority trees within and adjacent to the project limits, stating areas, and access routes; recommending removal of diseased, damaged or otherwise unhealthy trees that pose a potential safety hazard; evaluating effects of construction on future health of trees close to proposed work; and recommending and/or overseeing tree work amd care.

The Arborist for this item shall not be from the same company as the company responsible for selective clearing or tree removal work.

For projects with multiple phases, projects where construction activities (work or stockpiling) shifts, or when otherwise directed by the Engineer, the Arborist shall re-evaluate conditions and provide follow-up recommendations.

SUBMITTALS

- Contractor shall submit to the Engineer for approval by MassDOT Landscape Design the qualifications and experience of the Arborist. Submittal shall include copy of current certification and a resume summarizing specific construction experience (including relevant MassDOT projects) for a minimum of five projects.
- Arborist's Report documenting recommendations shall be submitted to the Engineer and an electronic copy forwarded to MassDOT Landscape Design Section. Report shall include the following:

SCOPE OF WORK

The Arborist shall be responsible for the following tasks:

- Initial Evaluation and Report
  - recommend and prioritize trees that require removal as appropriate to contract scope, project limits, and project intent;
  - review and modify, if necessary, tree protection measures shown on the drawings
  - review and mark limits of protective fencing for trees and groups of trees to be retained;
  - review and recommend protection measures for high priority trees;
  - submit a marked-up Construction Plan that briefly notes recommendations and

ITEM 102.55 (Continued)

decisions made in the field;
- submit a corresponding report including photo documentation;

- Oversight
  - direct or execute pruning of branches and/or roots, air spading, and/or other tree care operations
- Monitoring and Inspections
  - periodically inspect fencing and ensure root zones are properly protected and clear of equipment and materials as required by the Engineer
  - reevaluate tree protection measures for various phases of a project
  - submit inspection notes with relevant and dated photos to the Engineer.
- Special Care
  - oversee tree pruning for health and aesthetics
  - recommend fertilization and amendments
  - recommend and oversee pest control

METHODS

Prior to any work, the Arborist shall walk the site with the Contractor, the Engineer, the Town Tree Warden, and, if specified, the MassDOT Landscape Architect, to review trees, limits of construction activities, and other concerns. Where required for proper assessment of tree impacts, limits of work shall be staked or otherwise marked in the field prior to the site walk.

Trees to be removed shall be painted or otherwise marked.

Trees to be retained shall be marked such that it does not mar or damage the tree and such that marker is not easily removed. As applicable to the work and scope of the project, trees designated for removal or to be retained shall be noted on the plan and/or in the arborist's report and photographed.

Trees designated to remain that are damaged or removed by construction activities shall be noted and photographed for inclusion in inspection reports submitted to the Engineer.

MEASUREMENT AND BASIS OF PAYMENT

Item 102.55 will be measured for payment by the Hour of time spent onsite.

Item 102.55 will be paid at the contract unit price per hour upon submittal and acceptance of Reports described above.

ITEM 127.1 REINFORCED CONCRETE EXCAVATION CUBIC YARD

The work under this item shall conform to the relevant provisions of Subsection 112 of the Standard Specification and the following:

The work under these items shall include removal and proper disposal of the reinforced concrete box culvert at Muddy Brook as identified in the plans and where directed by the Engineer.

Work shall include full depth sawcutting thru the culvert, including any steel or iron reinforcement, and exposed rebar discovered in demolition. All concrete excavations shall be "squared off"; that is, each excavation shall have vertical sides upon completion. Sawcutting the reinforced concrete shall be incidental to this item.

All materials resulting from the concrete demolition shall become the property of the contractor. Work shall include removal and disposal of the concrete and any reinforcement materials, to an approved disposal facility.

METHOD OF MEASUREMENT

Item 127.1 will be measured and paid at the Contract unit price per Cubic Yard of reinforced concrete excavated, removed, and properly disposed of.

BASIS OF PAYMENT

Item 127. will be paid for at the Contract price per Cubic Yard, which shall include all labor, tools, equipment, and incidental costs required to complete the work, and final disposal of the excavated material as required by the Engineer. No separate payment will be made for sawcutting, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM

The work shall consist of ensuring the health and safety of the Contractor's employees and subcontracting personnel, the Engineer, their representatives, the environment, and public welfare from any on-site chemical contamination present in air, soil, water and sediment.

The Contractor shall prepare and implement a site-specific Environmental Health and Safety Plan (EHASP) which has been approved and stamped by a Certified Industrial Hygienist (CIH) and includes the preparer's name and work experience. The EHASP shall include appropriate components required by OSHA Standard 29 CFR 1910.120(b) and the Massachusetts Contingency plan (MCP) 310 CMR 40.0018 and must comply with all applicable state and federal laws, regulations, standards and guidelines, and provide a degree of protection and training appropriate for implementation on the project. The EHASP shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. The EHASP shall be developed and implemented independently from the standard construction HASP required to work on all MassDOT construction projects.

Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions, including but not limited to standards established by OSHA and National Institute for Occupational Safety and Health (NIOSH). Equipment used for the purpose of health and safety shall be approved by and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the most up-to-date version of the EHASP shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the MassDOT, Contractor, and Subcontractors involved with on-site activities. The employee's signature on the EHASP shall be deemed prima facie evidence that the employee has read and understands the plan. Updated copies of signature sheets shall be submitted to the Engineer.

The EHASP shall specify a Contractor Site Safety and Health Officer responsible for implementation of the EHASP and to oversee all construction activities, including handling, storage, sampling and transport, which require contact with or exposure to potentially hazardous materials.

The level of protection, required to ensure the health and safety of on-site personnel will be stipulated in the EHASP. The Site Safety and Health Officer shall implement the EHASP based on changing site and weather conditions, type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, air monitoring data, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and type of equipment to be utilized.

ITEM 180.01 (Continued)

During implementation of the EHASP, a daily log shall be kept by the Site Safety and Health Officer and a copy shall be provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personal protection being employed, screening data and any other information relevant to on-site environmental safety conditions. The Site Safety and Health Officer shall sign and date the daily log.

Method of Measurement and Basis of Payment

Preparation and implementation of the Environmental Health and Safety Program, including the monitoring, protection and storage of all contaminated materials, as well as subsequent modifications to the EHASP, will be measured and paid for at the Lump Sum Bid Price.

Payment of 50% of the Environmental Health and Safety Program contract price will be made upon the initial acceptance of the EHASP by the Engineer. Payment of the remaining 50% of the Environmental Health and Safety Program contract price will be made upon completion of the work. The bid price shall include preparation and implementation of the EHASP as well as the cost for its enforcement by the Site Safety and Health Officer along with any necessary revisions and updates. The work of implementing the Environmental Health and Safety Program includes work involving, but not limited to, the monitoring, protection, and storage of all contaminated materials.

ITEM 180.02 PERSONAL PROTECTION LEVEL C UPGRADE HOUR

The work shall consist of providing appropriate personal protective equipment (PPE) for all personnel in an area either containing or suspected of containing a hazardous environment.

Contingencies for upgrading the level of protection for on-site workers will be identified in the EHASP and the Contractor shall have the capability to implement the personal protection upgrade in a timely manner. The protective equipment and its use shall be in compliance with the EHASP and all appropriate regulations and/or standards for employee working conditions.

Personal Protection Level C Upgrade will be measured and paid only upon upgrade to Level C and will be at the contract unit price, per hour, per worker, required in Level C personal protection. No payment will be made to the Contractor to provide Level D PPE.

ITEM 180.03 LICENSED SITE PROFESSIONAL SERVICES HOUR

Within limited areas of the project site, media (i.e. soils, sediments, surface water and/or groundwater) requiring evaluation and/or management under the Massachusetts Contingency Plan (MCP) may be encountered. A Licensed Site Professional (LSP) shall be required to provide the services necessary to comply with the requirements of the MCP. These services may include a site walk, field screening, sampling, analysis and characterization of potentially contaminated media, preparation and implementation of Immediate Response Action (IRA) Plans, Utility-Related Abatement Measure (URAM) and Release Abatement Measure (RAM) Plans, Imminent Hazard Evaluations, status reports, transmittal forms, release notification forms, risk assessments, completion statements, and related documents required pursuant to the MCP. LSP services shall also be necessary to temporarily move material generated on the project to an off-site storage location.

The name and qualifications of the LSP and all environmental technicians to be assigned to the project shall be submitted to the Engineer for approval at least four weeks prior to initial site activities. The LSP shall have a current, valid license issued by the Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals. The LSP shall have significant experience in the oversight of MCP activities at active construction sites. Qualification packages for the LSP and each technician shall include a resume, all recent work assignments with responsibilities identified (previous 5 years), and applicable training and certifications. A list of all Notices of Noncompliance, Notice of Audit Findings and Enforcement Orders issued by the Massachusetts Department of Environmental Protection (DEP) shall be submitted for all work assignments listed for the LSP and environmental technicians. Upon approval of the LSP Qualifications, the LSP will be designated as the LSP of Record unless MassDOT designates in writing otherwise. The LSP of Record will serve as the primary point of contact for all hazardous material matters on the project.

The LSP shall evaluate soil and/or sediment with discoloration, odor, elevated field screening results, presence of petroleum liquid or sheen on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be oil or hazardous materials. Excavated soil and sediment which is suspected of petroleum contamination shall be field screened using the jar headspace procedures according to established DEP Guidance. All field screening equipment must be pre-approved by the Engineer. The LSP shall ensure proper on-site calibration of all field screening instrumentation.

The Engineer shall be contacted immediately when observations or any field screening results verify contamination requiring further analysis, and/or enhanced management of suspect media. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall evaluate the need for confirmatory sampling prior to backfill in areas where contaminated material has been excavated and disposed off-site for compliance with applicable regulatory requirements. The Engineer shall approve the locations of the testing sites prior to the sampling.

ITEM 180.03 (Continued)

Contaminated media shall be handled in accordance with all applicable state and federal statutes, regulations, and policies. The LSP shall adequately evaluate contaminated media for compliance with the requirements of the MCP and Department Policies.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and both shall be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations. The LSP shall maintain written records in a clear and concise tabular format which tracks the excavation, stockpiling, analysis and reuse/disposal of all known/suspect contaminated media. These records shall be up-to-date and submitted to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media in a tabular format and compare the results to applicable reporting thresholds. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results, evaluation of applicable regulatory exemptions, reporting obligations, and proposed course of action. The laboratory report together with Chain of Custody forms for all analytical results shall be submitted to the Engineer within 14 days after completion of such analyses.

The LSP and Contractor shall be held responsible for the submission of all MCP-related documents to the Engineer at least 14 days in advance of any timeframe specified in the MCP and for the timely submission of data and tracking information as noted within this Item. All documents prepared under this Item must be reviewed and signed by the approved LSP. The Contractor and LSP shall be responsible for all fines, damages, and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, damages, and enforcement actions.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

If the Contractor causes a release of OHM, the Contractor shall be responsible for assessing and remediating the release in accordance with all pertinent State and Federal regulations, including securing the services of a LSP, at his own expense.

The LSP shall coordinate all activities involving both MassDOT and the DEP through the Engineer. Any notification of release shall be approved by the Engineer before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

ITEM 180.03 (Continued)

LABORATORY TESTING IN SUPPORT OF LSP SERVICES

Laboratory testing provides for analytical testing in support of LSP services related to maintaining MCP compliance, such as delineating the extent and type of contamination present. Sampling and testing for disposal purposes are not included and are incidental to Items 181.11-181.14.

In order to maintain compliance with the MCP and Department Policies or other regulatory requirements, the LSP shall request approval from the Engineer to obtain samples from various locations and depths within the project area and to perform laboratory analyses on those samples. No sampling shall be conducted without prior approval from the Engineer. The samples shall be delivered to a DEP-certified laboratory using proper chain-of-custody documentation for analyses which, depending upon site conditions and suspected and/or identified contaminants of concern, may include, but are not limited to, metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (EPA Method 1311) for metals.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

LSP Services for work under this item will be measured per person, per hour of service provided by LSP, Environmental Technicians and other approved personnel. Travel time shall not be included in the billable hours.

The quantity and type of laboratory tests must be approved by the Engineer beforehand. The Contractor will be reimbursed upon satisfactory written evidence of payment. The Contractor may be required to obtain cost estimates from three DEP certified laboratories for the Engineer to choose the service provider.

LSP Services will be paid at the Contractor bid price for each hour, or fraction thereof, spent to perform the work as described above. The bid price shall be a blended rate that includes the cost of the LSP, environmental technicians and other personnel, the performance of all work tasks and field screening, including required equipment, materials and instrumentation, and production of all documentation described above. All requests for payment must be accompanied by the following information: the names of the personnel associated with the work charged under LSP Services, dates and hours worked, work conducted, including, where appropriate, locations as identified on the construction plans, and a copy of the field diary for the dates submitted.

Laboratory testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

ITEM 180.03 (Continued)

This item is for LSP work for compliance with the MCP and Department Policies. LSP hours and any laboratory testing related to off-site disposal of excess soil and sediment is incidental to Items 181.11-181.14 (including, but not limited to, disposal characterization, disposal package preparation, landfill acceptance, shipment paperwork preparation, field screening, and tracking). LSP hours for groundwater management (including characterization, obtaining off-site discharge permits, compliance testing, etc.) is incidental to Item 183.1.

ITEM 181.11 DISPOSAL OF UNREGULATED SOIL TON
ITEM 181.12 DISPOSAL OF REGULATED SOIL- IN-STATE FACILITY TON
ITEM 181.13 DISPOSAL OF REGULATED SOIL- OUT-OF-STATE FACILITY TON
ITEM 181.14 DISPOSAL OF HAZARDOUS WASTE TON

The work under these Items shall include the transportation and disposal of contaminated material excavated, or excavated and stockpiled. It shall also include the cost of any additional laboratory analyses required by a particular disposal facility beyond the standard disposal test set.

Excavation of existing subsurface materials may include the excavation of contaminated soils. The Contractor shall be responsible for the proper coordination of characterization, transport and disposal, recycling or reuse of contaminated soils. Disposal, recycling or reuse will be referred to as "disposal" for the purposes of this specification. However, regardless of the use of the term herein, there will be no compensation under these items for reuse within the project limits. The Contractor will be responsible for coordinating the activities necessary for characterization, transport and disposal of contaminated soils. Such coordination will include the Engineer and his/her designee overseeing management of contaminated materials. Contaminated soils must be disposed of in a manner appropriate for the soil classification as described below and in accordance with the applicable laws of local, state and federal authorities. The Contractor shall be responsible for identifying disposal facility (ies) licensed to accept the class of contaminated soils to be managed and assure that the facility can accept the anticipated volume of soil contemplated by the project. The Contractor shall be responsible for hiring a Licensed Site Professional (LSP) and all ancillary professional services including laboratories as needed for this work. The Contractor will be responsible for obtaining all permits, approvals, manifests, waste profiles, Bills of Lading, etc. subject to the approval of the Engineer prior to the removal of the contaminated soil from the site. The Contractor and LSP shall prepare and submit to the Engineer for approval all documents required under the Massachusetts Contingency Plan (MCP) and related laws and environmental regulations to conduct characterization, transport, and disposal of contaminated materials.

CLASSES OF CONTAMINATED SOILS

The Contractor and its LSP shall determine if soil excavated or soil to be excavated is unregulated soil or contaminated soil as defined in this section. Such materials shall be given a designation for purposes of reuse or disposal based on the criteria of the MCP. Soils and sediments which are not suitable for reuse will be given a designation for purposes of off-site disposal based on the characterization data and disposal facility license requirements. The Classes of Contaminated Soils are defined as follows:

ITEMS 181.11 through 181.14 (Continued)

UNREGULATED SOIL consists of soil, fill and dredged material with measured levels of oil and hazardous material (OHM) contamination at concentrations below the applicable Reportable Concentrations (RCs) presented in the MCP. Unregulated soil consists of material which may be reused (or otherwise disposed) as fill within the Commonwealth of Massachusetts subject to the non-degradation criteria of the MCP (310 CMR 40.0032(3), in a restricted manner, such that they are sent to a location with equal or higher concentrations of similar contaminants. Disposal areas include licensed disposal facilities, approved industrial settings in areas which will be capped or covered with pavement or loamed and seeded, and for purposes of this project should be reused as fill within the project site construction corridor whenever possible. The material cannot be placed in residential and/or environmentally sensitive (e.g. wetlands) areas. Under no circumstances shall contaminated soils be placed in an uncontaminated or less contaminated area (including the area above the groundwater table if this area shows no sign of contamination).

The Contractor shall submit to MassDOT the proposed disposal location for unregulated soils for approval. If such a disposal location is not a licensed disposal facility, the Contractor shall submit to the Engineer analytical data to characterize the disposal area sufficiently to verify that the unregulated material generated within the MassDOT construction project limits is equal to or less than the contaminant levels at the disposal site and meets the non-degradation requirements of the MCP. In addition, the Contractor shall provide written confirmation from the owner of the proposed disposal location that they have been provided with the analytical data for both the materials to be disposed as well as the disposal site characterization and that s/he agrees to accept this material. A Material Shipping Record or Bill of Lading, as appropriate, shall be used to track the off-site disposal of unregulated soil and a copy, signed by the disposal facility or property owner, shall be provided to the Engineer in order to document legal disposal of the unregulated material.

The cost of on-site disposal of unregulated soil within the project area will be considered incidental to the item of work to which it pertains.

ITEMS 181.11 through 181.14 (Continued)

REGULATED SOIL consists of materials containing measurable levels of OHM that are equal to or exceed the applicable Reportable Concentrations for the site as defined by the MCP, 310 CMR 40.0000. Regulated soil which meets the MCP reuse criteria of the applicable soil/groundwater category for this project area may be reused on site provided that it meets the appropriate geotechnical criteria established by the Engineer. Regulated Soil may be reused (as daily or intermediate cover or pre-cap contouring material) or disposed (as buried waste) at lined landfills within the Commonwealth of Massachusetts or at an unlined landfill that is approved by the Massachusetts Department of Environmental Protection (DEP) for accepting such material, in accordance with DEP Policy #COMM-97-001, or at a similar out-of-state facility. It should be noted that soils which exceed the levels and criteria for disposal at in-state landfills, as outlined in COMM-97-001, may be shipped to an in-state landfill, but require approval from the DEP Division of Solid Waste Management and receiving facility. An additional management alternative for this material is recycling into asphalt. Regulated Soils may also be recycled at a DEP approved recycling facility possessing a Class A recycling permit subject to acceptance by the facility and compliance with DEP Policy #BWSC-94-400. Regulated Soil removed from the site for disposal or treatment must be removed via an LSP approved Bill of Lading, Manifest or applicable material tracking form. This type of facility shall be approved/permitted by the State in which it operates to accept the class of contaminated soil in accordance with all applicable local, state and federal regulations.

HAZARDOUS WASTE consists of materials which must be disposed of at a facility permitted and operated in full compliance with Federal Regulation 40 CFR 260-265, Massachusetts Regulation 310 CMR 30.000, Toxic Substances Control Act (TSCA) regulations, or the equivalent regulations of other states, and all other applicable local, state, and federal regulations. All excavated materials classified as hazardous waste shall be disposed of at an out-of-state permitted facility. This facility shall be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility shall be approved/permitted by the State in which it operates to accept hazardous waste in accordance with all applicable local, state and federal regulations and shall be permitted to accept all contamination which may be present in the soil excavate. The Contractor shall ensure that, when needed, the facility can accept TSCA waste materials i.e. polychlorinated biphenyls (PCBs). Hazardous waste must be removed from the site for disposal or treatment via an LSP approved Manifest.

MONITORING/SAMPLING/TESTING REQUIREMENTS

The Contractor shall be responsible for monitoring, sampling and testing during and following excavation of contaminated soils to determine the specific class of contaminated material. Monitoring, sampling and testing frequency and techniques should be performed in accordance with Item 180.03 – LSP Services. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis shall be included in the bid cost for the applicable disposal items. The Contractor shall obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

ITEMS 181.11 through 181.14 (Continued)

No excavated material will be permanently placed on-site or removed for off-site disposal until the results of chemical analyses have been received and the materials have been properly classified. The Contractor shall submit to the Engineer results of field and laboratory chemical analyses tests within seven days after their completion, accompanied by the classification of the material determined by the Contractor, and the intended disposition of the material. The Contractor shall submit to the Engineer for review all plans and documents relevant to LSP services, including but not limited to, all documents that must be submitted to the DEP.

WASTE TRACKING:

Copies of the fully executed Weight Slips/Bills of Lading/ Manifests/Material Shipping Records or other material tracking form received by the Contractor from each disposal facility and for each load disposed of at that facility, shall be submitted to Engineer and the Contractor's LSP within three days of receipt by the Contractor. The Contractor is responsible for preparing and submitting such documents for review and signature by the LSP or other appropriate person with signatory authority, three days in advance of transporting soil off-site. The Contractor shall furnish a form attached to each manifest or other material tracking form for all material removed off-site, certifying that the material was delivered to the site approved for the class of material. If the proposed disposition of the material is for reuse within the project construction corridor, the Contractor shall cooperate with MassDOT to obtain a suitable representative sample(s) of the material to establish its structural characteristics in order to meet the applicable structural requirements as fill for the project.

All material transported off-site shall be loaded by the Contractor into properly licensed and permitted vehicles and transported directly to the selected disposal or recycling facility and be accompanied by the applicable shipping paper. At a minimum, truck bodies must be structurally sound with sealed tail gates, and trucks shall be lined and loads covered with a liner, which shall be placed to form a continuous waterproof tarpaulin to protect the load from wind and rain.

DECONTAMINATION OF EQUIPMENT

Tools and equipment which are to be taken from and reused off site shall be decontaminated in accordance with applicable local, state and federal regulations. This requirement shall include, but not be limited to, all tools, heavy machinery and excavating and hauling equipment used during excavation, stockpiling and handling of contaminated material. Decontamination of equipment is considered incidental to the applicable excavation item.

ITEMS 181.11 through 181.14 (Continued)

REGULATORY REQUIREMENTS

The Contractor shall be responsible for adhering to regulations, specifications and recognized standard practices related to contaminated material handling during excavation and disposal activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent State or Federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules, regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts DEP, the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing the disposal of contaminated soils.

All labor, materials, equipment and services necessary to make the work comply with such regulations shall be provided by the Contractor without additional cost to MassDOT. Whenever there is a conflict or overlap within the regulations, the most stringent provisions shall apply. The Contractor shall reimburse MassDOT for all costs it incurs, including damages and/or fines, as a result of the Contractor's failure to adhere to the regulations, specifications, recognized standard practices, etc., that relate to contaminated material handling, transportation and disposal.

SUBMITTALS

I. Summary of Sampling Results, Classification of Material and Proposed Disposal Option.

The following information, presented in tabular format, must be submitted to the Engineer for review and approval prior to any reuse on-site or disposal off-site. This requirement is on-going throughout the project duration. At least two weeks prior to the start of any excavation activity, the Contractor shall submit a tracking template to be used to present the information as stipulated below. Excavation will not begin until the format is acceptable to MassDOT.

Characterization Reports will be submitted for all soil, sediment, debris and groundwater characterized through the sampling and analysis program. Each report will include a site plan which identifies the sampling locations represented in the Report. The Construction Plan sheets may be used as a baseplan to record this information.

The Sampling Results will be presented in tabular format. Each sample will be identified by appropriate identification matching the sample identification shown on the Chain of Custody Record. The sample must also be identified by location (e.g. grid number or stockpile number). For each sample, the following information must be listed: the classification (unregulated, regulated, etc.), proposed disposal option for the stockpile or unit of material represented, and, all analytical results.

ITEMS 181.11 through 181.14 (Continued)

Each Characterization Report will include the laboratory analytical report and Chain of Custody Record for the samples included in the Report.

II. Stockpiling, Transport, and Disposal.

At least two weeks prior to the start of any excavation activity, the Contractor shall submit, in writing, the following for review and shall not begin excavation activity until the entire submittal is acceptable to MassDOT.

Excavation and Stockpiling Protocol:
Provide a written description of the management protocols for performing excavation and stockpiling and/or direct loading for transport, referencing the locations and methods of excavating and stockpiling excavated material.

Disposal and Recycling Facilities:

1. Provide the name, address, applicable licenses and approved waste profile for disposal and/or recycling location(s) where contaminated soil will be disposed. Present information substantiating the suitability of proposed sites to receive classifications of materials intended to be disposed there, including the ability of the facility to accept anticipated volumes of material.

2. Provide a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. Material should not be sent to facilities which are actively considered by the DEP, USEPA or other responsible agency to be in violation of federal, state or local hazardous waste or hazardous material regulations. MassDOT reserves the right to reject any facility on the basis of poor compliance history.

Transportation:
The name, address, applicable license and insurance certificates of the licensed hauler(s) and equipment and handling methods to be used in excavation, segregation, transport, disposal or recycling.

III. Material Tracking and Analytical Documentation for Reuse/Disposal.

The following documents are required for all excavation, reuse and disposal operations and shall be in the format described. At least two weeks prior to the start of any excavation or demolition activity, the Contractor shall submit the tracking templates required to present the information as stipulated below. Excavation or demolition will not begin until the format is acceptable to MassDOT.

ITEMS 181.11 through 181.14 (Continued)

All soils, sediments and demolition debris must be tracked from the point of excavation to stockpiling to onsite treatment/processing operations to off-site disposal or onsite reuse as applicable.

Demolition Debris:
Demolition debris must be tracked if the debris is stockpiled at a location other than the point of origin or if treatment or material processing is conducted. Identification of locations will be based on the station-offset of the location. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations/comments, quantity, and stockpile ID/processing operation location. For each unit of material tracked, the table will also track reuse of the material on-site, providing reuse date, location of reuse as defined by start and end station, width of reuse location by offset, the fill elevation range, quantity, and finish grade for said location. For demolition debris which is not reused on site, the table will also track disposal of the material as defined by disposal date, quantity and disposal facility. The table must provide a reference to any analytical data generated for the material.

Soil/Sediment:
Soil excavation will be identified based on the station-offset of the excavation location limits. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations, quantity, and stockpile number/location. For each unit of material tracked, the table will also track reuse of the material on-site and disposal of the material off-site using the same categories identified for demolition debris above.

Method Of Measurement And Basis Of Payment

Disposal of contaminated soil shall be measured for payment by the Ton of actual and verified weight of contaminated materials removed and disposed of. The quantities will be determined only by weight slips issued by and signed by the disposal facility. The most cost-effective, legal disposal method shall be used. The work of the LSP for disposal under all of these items shall be incidental to the work with no additional compensation.

ITEM 181.11 Measurement for Disposal of Unregulated Soil shall be under the Contract Unit Price by the weight, in tons, of contaminated materials removed from the site and transported to and disposed of at an approved location or licensed facility, and includes any and all costs for approvals, permits, fees and taxes, additional testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.12 Measurement for Disposal of Regulated Soil – In-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved in-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEMS 181.11 through 181.14 (Continued)

ITEM 181.13 Measurement for Disposal of Regulated Soil - Out-of-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved out-of-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.14 Measurement for Disposal of Hazardous Waste shall be under the Contract Unit Price by the weight in tons of hazardous waste removed from the site and transported to and disposed of at the licensed hazardous waste facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS LUMP SUM

The work shall include the inspecting and testing of all materials suspected of containing asbestos. When any demolition is required to enable the inspection and testing of the suspected material it will be considered incidental to this Item and the Contractor must perform all asbestos handling and testing in accordance with the regulations stated below.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during any disturbance of asbestos suspected material. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the Health And Safety Plan (HASP) may pose a safety hazard to the workers.

The Contractor shall employ the services of a Massachusetts licensed "Asbestos Inspector" to inspect the material to determine whether or not "ITEM 182.2 REMOVAL OF ASBESTOS" is required. Should the asbestos inspector determine laboratory testing is required, a state certified laboratory shall be used to perform all necessary tests.

REGULATIONS

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58 Occupational exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule
29 CFR 1910 Section 134 Respiration Protection
29 CFR 1926 Construction Industry
29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
29 CFR 1910 Section 1200 Hazard Communication
29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
40 CFR 61 Subpart A Regulation for Asbestos
40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor and Industries Regulations, (DLI) including but not limited to:

ITEM 182.1 (Continued)

454 CMR 28.00 Removal, Containment and Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise, Section 7.15 Air Pollution Control Regulations
310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

BASIS OF PAYMENT

Item 182.1 will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, tools, equipment, and all incidental costs required to complete the work as described and as required by the Engineer.

No separate payment will be made for the protection of general public, private property, the proper inspecting and testing of the material, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 182.2 REMOVAL OF ASBESTOS FOOT

The work shall include the removal and satisfactory disposal of existing asbestos. The Contractor's attention is directed to the fact that existing asbestos shall be inspected and tested prior to removal, to determine if special removal and disposal is required. The Contractor shall follow all the rules and regulations stated in "ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS". If asbestos is present, the Contractor shall follow all the rules and regulations stated in the section "REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS", under this Item. The Contractor should notify and coordinate his/her efforts with the proper utility accordingly.

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

This section specifies the requirements for the handling and removal of asbestos containing material. The Contractor must perform all asbestos handling and removal work in accordance with these specifications and the following additional requirements.

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58
Occupational exposure to Asbestos, Tremolite,
Anthophyllite and Actinolite, Final Rule
29 CFR 1910 Section 134 Respiration Protection
29 CFR 1926 Construction Industry
29 CFR 1910 Section 2 Access to Employee Exposure
and Medical Records
29 CFR 1910 Section 1200 Hazard Communication
29 CFR 1910 Section 145 Specifications for Accident
Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50
no.134, July 12, 1985 p.28530 - 28540 Asbestos
Abatement Projects Rule
40 CFR 61 Subpart A Regulation for Asbestos
40 CFR 61 Subpart M (Revised Subpart B) National Emission
Standard for Asbestos

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor Standards, (DLS) including but not limited to:

454 CMR 28.00 Removal, Containment and
Encapsulation of Asbestos

ITEM 182.2 (Continued)

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise, Section 7.15 Air Pollution Control Regulations

310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

All asbestos material shall be removed and properly disposed of by a contractor or subcontractor with a current Massachusetts Abatement Contractors License issued by the Department of Labor Standards. Work shall be supervised by a competent person as required by OSHA in 29 CFR 1926 to ensure regulatory compliance. This person must have completed a course at an EPA Training Center or equivalent course in asbestos abatement procedures, have had a minimum of four years on-the-job training and meet any additional requirements set forth in 29 CFR 1926 for a Competent Person. This person must also be certified by the Commonwealth as an Asbestos Supervisor and Asbestos Project Designer as required by 454 CMR 28.00.

Asbestos removal work shall be coordinated with all other work under the contract and shall be completed prior to performing any activities which could disturb the asbestos material or produce airborne asbestos fibers.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during trenching and excavation. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the Health and Safety Plan (HASP) may pose a safety hazard to the workers.

NOTIFICATION AND PERMITS

The Contractor shall prepare a formal pre-notification form at least ten (10) days prior to the start of asbestos removal work. This form must be submitted to the appropriate Regional Office of the Massachusetts Department of Environmental Protection and to the U.S. Environmental Protection Agency Region I Air and Hazardous Material Division. A copy of the submitted forms must be provided to the Engineer and kept at the work site.

ITEM 182.2 (Continued)

Prior to starting any work, the Contractor shall also obtain any required asbestos removal permit(s) from the city/town. A copy of the permit(s) must be provided to the Engineer and posted at the work site.

The Contractor shall also obtain and pay all other applicable asbestos waste transportation and disposal permits, licenses and fees.

STANDARD OPERATING PROCEDURES

The standard operating procedure shall ensure the following:

1. Proper site security including posting of warning signs and restricting access to prevent unauthorized entry into the work spaces.

2. Proper protective clothing and respiratory protection prior to entering the work spaces.

3. Safe work practices including provisions for communications; exclusion of eating, drinking, smoking, or use of procedures or equipment that would in any way reduce the effectiveness of respiratory protection or other engineering controls.

4. Proper exit practices from the work space though the showering and decontamination facilities.

5. Removing asbestos containing material in ways that minimize release of fibers.

6. Packing, labeling, loading, transporting and disposing of contaminated material in a way that minimizes or prevents exposure and contamination.

7. Emergency evacuation of personnel, for medical or safety (fire and smoke) so that exposure will be minimized.

8. Safety from accidents in the work space, especially from electrical shocks, slippery surfaces and entanglements in loose hoses and equipment.

9. Provisions for effective supervision and OSHA - specified personnel air monitoring for exposure during work.

REQUIRED SUBMITTALS

The Contractor shall submit to the Engineer the following listed items at least ten (10) calendar days prior to the start of asbestos work. No asbestos removal work activities shall commence until these items are reviewed by the Engineer, unless otherwise waived. Submittals shall be clearly labeled and in sufficient detail to enable the Engineer to form an opinion as to its conformity to the specifications.

ITEM 182.2 (Continued)

1. Name, experience and DLS certification of proposed Supervisors and Foreman responsible for asbestos work.

2. Summary of workforce by disciplines and a notarized statement documenting that all proposed workers, by name, have received all required medical exams and have been properly trained and certified for asbestos removal work, respirator use and appropriate Massachusetts DLS, EPA and OSHA standards.

3. Notarized statement that workers are physically fit and able to wear and use the type of respiratory protection proposed for the project. Notarized certification signed by an officer of the abatement contracting firm that exposure measurements, medical surveillance and worker training records are being kept in conformance with 29 CFR 1926.

4. Written plan of action and standard operating procedures (HASP) to include: location and layout of decontamination areas; sequencing of asbestos work; detailed schedule of work activities by date and interface with other project activities which affect work performance; methods used to assure safety and security; worker protection and exposure monitoring; contingency and emergency evacuation procedures; detailed description of methods to be employed to control pollution; waste handling procedures.

5. Written respiratory protection program specifying level of protection intended for each operation required by the project and details of daily inspection and maintenance elements.

6. Copies of the U.S. EPA, State and local asbestos removal pre-notification forms. If applicable, lists and copies of all permits, licenses, or manifests which will be applied for and used.

7. Name, location and applicable approval certificates for primary and secondary landfill for disposal of asbestos-containing or asbestos contaminated waste. Name, address and licenses number(s) of hauler permitted to transport waste. (Submit copies of completed manifests upon disposal).

The Contractor must provide copies of daily inspection and record logs upon request of the Engineer, at any time during project. This information will include but is not limited to work area entry data, respirator inspections and maintenance, HEPA-exhaust inspections and maintenance and other work applicable activities or reports of accidents or unusual events.

ITEM 182.2 (Continued)

METHOD OF MEASUREMENT

Item 182.2 will be measured by the FOOT for the complete removal and disposal of the asbestos containing material.

BASIS OF PAYMENT

Item 182.2 will be paid for at the Contract unit price per FOOT, which price shall include all labor, materials, tools, equipment, and all incidental costs required to complete the work specified above and as required by the Engineer.

No separate payment will be made for the protection of general public, private property, the proper inspecting and testing of the material, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 183.1 TREATMENT OF CONTAMINATED GROUNDWATER GALLON

This Item addresses the treatment and disposal of contaminated groundwater encountered during excavation operations. The work generally consists of furnishing the materials, equipment, labor, services, testing/sampling, waste characterization, transportation, disposal, permits and agreements necessary to perform the work required for the collection, treatment and disposal of contaminated groundwater.

The Contractor is advised that contaminated groundwater may be encountered during dewatering activities. The levels and nature of contamination may vary depending on location and/or depth. No data has been provided in this specification indicating the types of contaminants that may be found in groundwater encountered during this work. It will be the responsibility of the Contractor to ensure that water removed during dewatering operations is treated and disposed of in accordance with all applicable laws and regulations and in accordance with this specification.

The Contractor shall monitor the quantity of groundwater collected for treatment using an in-line totalizer flowmeter or an alternate method approved by MassDOT. The Contractor shall, at all times, minimize the quantity of groundwater removed from the excavations. All groundwater determined to be contaminated will be managed in accordance with all applicable local, state and federal regulations.

It is not the intent herein for the Department to design for or specify to the Contractor which particular treatment is to be used, if necessary. Rather, it is the Department's intent to provide guidance to the Contractor for informational and bidding purposes only. It is, therefore, the Contractor's responsibility to use a treatment method to allow him/her to meet any and all laws, regulations, policies, guidelines and permit requirements. Treatment of contaminated groundwater for dewatering operations is generally performed using a mobile treatment trailer equipped with one or more granular-activated carbon (GAC) canisters, although other techniques are also used.

It is likely that treatment of the contaminated groundwater using granular-activated carbon will be required to complete the work under this Contract. The Methods described under Item 183.1 provides for the identification, testing, management and treatment or disposal of contaminated groundwater and shall be implemented, at a minimum and as necessary by the Contractor via Methods under Item 183.1.

The overall handling and management of contaminated groundwater is regulated under the provisions of 310 CMR 40.0000, 314 CMR 3.00 and 5.00, NPDES and other applicable laws. The unpermitted discharge of contaminated dewatering effluent into the environment (storm drain, surface water body, onto the ground) is a violation of federal and state laws and regulations. Should dewatering of contaminated groundwater be necessary, approvals must be sought from the appropriate federal, state, or local regulatory jurisdiction. The USEPA will not specify a treatment system or method, but normally requires that the treated discharge meet Massachusetts Drinking Water Standards.

ITEM 183.1 (Continued)

The discharge standards are normally met by treating the dewatered groundwater through granular-activated carbon canisters, or similar techniques. Longer term discharges to surface waters or storm drains, and any discharges to the ground, require approval and/or issuance of a permit from the DEP Division of Water Pollution Control. The Contractor shall be responsible for applying for, paying all fees for and obtaining all permits required for treatment and/or disposal of contaminated groundwater. Additional requirements may be mandated by local/regional sewer authorities for discharge to sanitary sewer or Publicly Owner Treatment Works (POTW). Copies of permit applications and correspondence from federal and state agencies and sewer authorities shall be supplied to the Engineer prior to dewatering activities.

EPA regulations published in the Federal Register on September 9, 2005 (70 FR 53663) require a National Pollutant Discharge Elimination System (NPDES) Remediation & Miscellaneous Contaminated Sites General Permit (RGP) for all contaminated construction site dewatering activities in Massachusetts (MAG910000) that will involve the discharge of water to classes of receiving waters designated in the Massachusetts Water Quality Standards (314 CMR 4.00). The application requires that operators of proposed new discharges seeking coverage under this general permit submit a Notice of Intent (NOI) to EPA New England post-marked at least 14 days prior to commencement of discharge. The Contractor is solely responsible for applying for and obtaining coverage under the NPDES Remediation General Permit from EPA and, if applicable, DEP, including the costs associated with sampling and analysis of groundwater and any application fees. The Contractor is required to submit a completed copy of the NOI to the Engineer and the Director of Environmental Programs, Construction Division, 10 Park Plaza, Boston, prior to commencement of discharge.

Upon permanent cessation of the discharges authorized by the RGP, the Contractor shall be responsible for submitting a Notice of Termination (NOT) to EPA New England within 30 days of the permanent cessation. The Contractor is required to submit to MassDOT a completed copy of the NOT within 14 days of the permanent cessation of the discharges authorized by the RGP. All costs and fees associated with the submission of the NOT will be the responsibility of the Contractor.

The Contractor shall be responsible for adhering to regulations, specifications, and recognized standard practices related to contaminated groundwater handling during dewatering activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent local, state or federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts Department of Environmental Protection (DEP), the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing this work.

The Contractor shall be responsible for determining compliance with the requirements of any permit and for any sampling, testing, and disposal required in connection with said permits. MassDOT and the City/Town reserve the right to collect additional samples of dewatered groundwater to determine the Contractor's compliance with the Permit's requirements. All laboratory testing is to be performed by a DEP certified laboratory for all parameters being tested. Copies of all field and laboratory testing results, reports, etc. required by the permits must be supplied to the Engineer. MassDOT, DEP, and the permit-granting agency, where applicable, reserve the right to collect additional samples of discharged groundwater to verify compliance with permit requirements.

ITEM 183.1 (Continued)

For the purpose of these specifications and to establish a basis for the bid, it is anticipated that granular-activated carbon will be the treatment medium for dewatered contaminated groundwater. The bidder shall factor into the payment item all costs associated with the testing and analyses that may be required by the permitting agency. In addition, any laboratory testing of groundwater is to be performed by a DEP certified laboratory for the parameters being tested. Copies of all field and laboratory testing results will be supplied to the Engineer. Bid price shall also include full compensation for labor, materials, maintenance, mobilization, rental and other related costs. Item 183.2 will be used for disposal of used granular-activated carbon canisters.

SUBMITTALS:

Prior to initiating work, the Contractor shall submit an excavation dewatering plan to the MassDOT that includes a detailed description of the approach to dewatering, a description of methodology for sealing the excavation to minimize infiltration of groundwater, if deemed applicable to the work, anticipated treatment, discharge points, sampling frequency, required permits, transporters and waste facilities complete with license numbers, permit numbers, contact person, and address and telephone number that the Contractor plans to utilize for waste disposal. The plan shall be submitted for the record.

The Contractor shall submit to MassDOT for review, the proposed methods for dewatering and groundwater treatment and disposal for the various portions of the work to be done. The review shall be for methods only. The Contractor shall remain responsible for the maintenance, performance, structural integrity and safety of the systems installed for this work as well as regulatory compliance of the applicable local, state and federal discharge standards. The contractor shall provide all groundwater sampling and analyses, results and reports required by all applicable local, state and federal agencies. The Contractor shall submit to MassDOT for review all plans and documents that must be submitted to the EPA and DEP, including NOI, NOT, treatment system analytical reports and correspondence. Copies of all permits and approvals and lab analyses and test results associated with groundwater treatment and disposal must be submitted to MassDOT within 3 days of receipt by the Contractor.

ITEM 183.1 (Continued)

ESTABLISHMENT OF TREATMENT PROCEDURE:

Since concentrations of contaminants in groundwater cannot be easily assessed in the field, all groundwater extracted from the ground will be considered contaminated and will be initially pumped and stored into open settling tank(s) or a fractionation tank until it can be sampled and analyzed, unless otherwise directed by MassDOT. The Contractor will perform initial sampling and analyses of the groundwater to determine the need for a permit to dispose of contaminated groundwater. Based on the results of the initial sample analysis, which must be provided to the Engineer within twenty-four (24) hours of the time the samples are received by the laboratory, the Contractor will determine the necessity for treatment(s) and disposal procedures. Sampling must also be performed to meet applicable discharge criteria as set by the appropriate regulatory agencies for the permit obtained for disposal. All discharges must meet regulatory standards set forth in the permits required for discharge. For the purposes of the bidding process, it is anticipated that the treatment system will consist of sedimentation tanks, an oil water separator and liquid-phase granular activated carbon as the primary on-site treatment medium for dewatered contaminated groundwater. MassDOT may require additional treatment processes if such is determined necessary during the groundwater testing procedure. The Contractor shall integrate the additional treatment process into the treatment system, if necessary.

The Contractor shall provide all labor, equipment and appurtenances required to treat the groundwater, subject to the approval of MassDOT. Groundwater stored and tested but not requiring treatment or off-site disposal shall be discharged to a location subject to the approval of MassDOT without payment to the Contractor.

TREATMENT UNITS:

The Contractor shall furnish all labor and materials, and shall install and operate temporary groundwater treatment and disposal system(s) as necessary to treat contaminated groundwater pumped from excavations during construction activities under the Contract. Such systems shall be capable of treating groundwater to meet applicable discharge criteria as set by the appropriate regulatory agencies.

The Contractor or their Environmental Consultant shall operate, maintain and modify the selected treatment system, and conduct the necessary monitoring and reporting of influent, midpoint and effluent results, as required by the discharge permit for the disposal option selected.

ITEM 183.1 (Continued)

COMPENSATION:

METHOD OF MEASUREMENT:

Provide a treatment system that meets permit discharge requirements, mobilize it to the site, provide copies of laboratory analytical data indicating that the system is performing appropriately to meet permit requirements, and demobilize it from the site. This includes management and disposal of wastes generated during treatment prior to discharging such as activated carbon, etc. Work under Item 183.1 is based upon the number of gallons disposed or contaminated groundwater pumped through the granular-activated carbon (Item 183.2) as the medium for the treatment of contaminated groundwater that is found in pipe trenches, manhole excavations, catch basin excavations, that need to be dewatered.

BASIS OF PAYMENT:

Payment shall be made at the unit price bid per gallon of groundwater pumped, stored, treated as needed and tested as required by discharge permits and regulatory requirements, which price shall be full compensation for all necessary labor and materials, mobilization, maintenance, demobilization of the appropriate unit(s), freight, rental costs, field and laboratory testing costs and permits. Costs associated with the disposal of granular-activated carbon shall be covered under Item 183.2.

ITEM 183.2 DISPOSAL OF GRANULAR-ACTIVATED CARBON POUND

GENERAL

Work under Item 183.2 is based upon the disposal of used granular-activated carbon as the treatment medium for contaminated groundwater (Item 183.1) that is found during excavations in which contaminated groundwater is encountered.

BASIS OF PAYMENT

Payment shall be made at the unit price bid per pound of carbon that is properly disposed and replaced, as necessary, to meet treated water discharge requirements during dewatering operations at the site. Payment for Disposal of Granular Activated Carbon shall include compensation for all labor, equipment, materials, permits, characterization, sampling and on-site or laboratory analysis as needed or required by permits, for replacement and disposal of liquid-phase activated carbon for the on-site contaminated groundwater pumping, collection, treatment and treated water discharge system during the time period required to complete the work. No payments shall be made for replacing carbon which is spent due to the Contractor's failure to remove floating petroleum product or excess sediments prior to the groundwater entering the carbon treatment units. All other costs associated with treatment of contaminated groundwater will be covered under Item 183.1- Treatment of Contaminated Groundwater.

ITEM 201.4 SPECIAL CATCH BASIN – DOUBLE GRATE EACH

The work under these Items shall conform to the relevant provisions of Subsection 201 of the Standard Specifications and the following:

The work will consist of the construction of catch basins and shall conform Materials Sections M4 and M8 of the Standard Specifications, and Materials Section M4.05.1 for Precast Concrete Highway Units, and/or amended as follows:

Work consists of furnishing all labor, materials, tools, and equipment and the performance of all work required to furnish the Special Catch Basin – Double Grate as shown on the plans and detail and/or as directed by the Engineer.

MATERIALS

Special Catch Basins – Double Grate shall be precast concrete structures with an inside diameter of 5 feet and a 4-foot sump.

All proposed Special Catch Basins – Double Grate shall be constructed on a bedding of 12 inches of crushed stone conforming to Material Section M2. All excavation and bedding for the structures shall be included in the cost of this item.

Special Catch Basins – Double Grate shall be as shown on the details. Units may be precast or block structures. Concrete block (if used) shall be listed on the Qualified Construction Materials List (QCML).

The cone sections of catch basins shall be replaced with flat top sections as needed at no additional cost. All castings located within the pavement area shall not be set to finished grade until after the binder course has been placed.

All frames shall be set in a concrete collar conforming to Construction Standard Detail E 202.9.0 prior to placement of the top course pavement. The cost of the concrete collar shall be included in the unit price bid for this item.

METHOD OF MEASUREMENT

Item 201.4 will be measured by the EACH Special Catch Basin Double Grate installed, complete in place.

BASIS OF PAYMENT

Item 201.4 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, tools, and equipment necessary for the construction of the catch basin including walls, base, top, concrete masonry and shall also include excavation, disposal of surplus materials, bedding, backfilling and all other work necessary to complete the work.

No separate payment will be made for structure depth beyond the standard depth of 6.5’. Special Catch Basins – Double Grate shall be paid for as a single unit regardless of depth. Frame and grate, including installations, shall be included in the cost of this item, and will be paid for under this item.

ITEM 201.6 SPECIAL CATCH BASIN - OFFSET EACH

The work under these Items shall conform to the relevant provisions of Subsection 201 of the Standard Specifications and the following:

The work will consist of the construction of catch basins and shall conform Materials Sections M4 and M8 of the Standard Specifications, and Materials Section M4.05.1 for Precast Concrete Highway Units, and/or amended as follows:

Work consists of furnishing all labor, materials, tools, and equipment and the performance of all work required to furnish the Special Catch Basin – Offset as shown on the plans and detail and/or as directed by the Engineer.

MATERIALS

Special Catch Basins – Offset shall be concrete structures with an inside diameter of 4 feet and a 4-foot sump.

All proposed Special Catch Basins – Offset shall be constructed on a bedding of 12 inches of crushed stone conforming to Material Section M2. All excavation and bedding for the structures shall be included in the cost of this item.

Special Catch Basins – Offset shall be as shown on the details. Units shall be concrete block structures. Concrete block shall be listed on the Qualified Construction Materials List (QCML). Channel sections shall be concrete with a minimum 28-day compression strength of 4,000 psi with reinforcing steel conforming to the latest ASTM A1064 specifications.

The cone sections of catch basins shall be replaced with flat top sections as needed at no additional cost.

All castings located within the pavement area shall not be set to finished grade until after the binder course has been placed.

All frames shall be set in a concrete collar conforming to Construction Standard Detail E 202.9.0 prior to placement of the top course pavement.

ITEM 201,6 (Continued)

METHOD OF MEASUREMENT

Item 201.6 will be measured for payment by the EACH Special Catch Basin – Offset installed, complete in place.

BASIS OF PAYMENT

Item 201.6 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, tools, and equipment necessary for the construction of the catch basin including walls, base, top, concrete masonry and shall also include excavation, disposal of surplus materials, bedding, backfilling and all other work necessary for constructing a catch basin as specified. The cost of the concrete collar shall be included in the unit price bid for this item.

No separate payment will be made for structure depth beyond the standard depth of 6.5'. Special Catch Basins – Offset shall be paid for as a single unit regardless of depth.

Frame and grate, including installations, shall be excluded in the cost of this item, and will be paid for under Item 222.1, Frame and Grate – MassDOT Cascade Type.

ITEM 202.	**MANHOLE**	**EACH**
ITEM 202.2	**MANHOLE (9 TO 14 FOOT DEPTH)**	**EACH**
ITEM 202.5	**SPECIAL MANHOLE (WITH WEIR)**	**EACH**

The work under these items shall conform to the relevant provisions of Subsection 201 of the Standard Specifications and the following:

The work will consist of the construction of drain manholes and shall conform to Materials Sections M4 and M8 of the Standard Specifications, and Materials Section M4.05.1 for Precast Concrete Highway Units, and/or amended as follows:

CONNECTING TO EXISTING DRAINAGE PIPES:

Where new structures shown on the plans are to connect to existing pipes to remain, the remaining pipe shall be cleaned from the new structure to the next structure downstream. Test pits to locate and survey the existing pipe shall be performed prior to ordering the structure. The existing pipe or pipes shall be carefully cut or removed to allow the installation of the new drainage system. The existing pipe end shall be cut off flush with the inside face of the proposed structure wall and the remaining space around the pipe completely filled with red brick set in cement grout for the full thickness of the structure wall.

The manhole shall be placed on a bedding of 12 inches of crushed stone.

No separate payment will be made for the cost of connecting existing pipes to new structures, but all costs in connection therewith shall be included in the unit price bid for the various structure items. If new pipe or pipe section are required to extend the existing line to and through the new structure wall, the new pipe will be paid for under the unit price per foot established under that Item.

METHOD OF MEASUREMENT

Items 202. 202.2 and 202.5 will be measured for payment by the EACH Manhole, Manhole (9 to 14 Foot Depth) and Special Manhole with Weir installed, complete in place.

BASIS OF PAYMENT

Items 202., 202.4, and 202.5 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, tools and equipment necessary for the construction of the drain manhole including walls, base, top, concrete masonry, and steel baffle wall and shall also include excavation, disposal of surplus materials, crushed stone for bedding, backfilling and all other work necessary for constructing a drain manhole as specified.

ITEMs 202, 202.2 and 202.5 (Continued)

No separate payment will be made for structure depth beyond a standard depth of 6.5 feet. Manholes shall be paid for as a single unit regardless of depth.

The weir material and method of fastening for Item 202.5 shall be as specified in the provided details. No separate payment will be made for the material, attachment, or method of embedment of the weir for Item 202.5. All work necessary for constructing the manhole as detailed shall be included in Contract unit price per Each.

Frame and grate or frame and cover, including installations, shall be excluded in the cost of this item, and will be paid for under Item 221.1, Frame and Cover - Secured

ITEM 203.5	**SPECIAL MANHOLE – 5 FOOT DIAMETER**	**EACH**
ITEM 203.6	**SPECIAL MANHOLE – 6 FOOT DIAMETER**	**EACH**

The work under these items shall conform to the relevant provisions of Subsection 201 of the Standard Specifications and the following:

The work shall include furnishing and installation of 5-foot, 6-foot and 7-foot diameter precast concrete manholes at the locations shown on the plans and as required by the Engineer. Special manholes shall be precast concrete and capable of supporting H-20 vehicle loading.

Shop drawings and clock diagrams shall be submitted for review and approval prior to fabrication.

METHOD OF MEASUREMENT

Item 203.5, Item 203.6 will be measured for payment by the Each special manhole installed, regardless of the depth of the structure, complete in place.

BASIS OF PAYMENT

Item 203.5, Item 203.6 will be paid for at the respective Contract unit prices per Each, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

Frames and covers will be paid for separately under Item 221.1 – Frame and Cover Secured.

ITEM 204.11 GUTTER INLET - SPECIAL EACH

The work under these Items shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications, and the following:

Gutter Inlets - Special shall be constructed of the materials, size, thickness and in the manner shown in construction details in the Plans.

METHOD OF MEASUREMENT

Items 204.11, Gutter Inlet – Special will be measured for payment as complete units per EACH regardless of depth.

BASIS OF PAYMENT

Items 204.11, Gutter Inlet – Special will be paid for at the contract unit price per EACH, which price shall be full compensation for all labor, materials, equipment, and incidental cost required to complete the work.

Frame and Grate will be paid for separately under Item 222.1 Frame and Grate – MassDOT Cascade Type.

Crushed stone for bedding shall be paid for under Item 156. Crushed Stone.

ITEM 221.1 FRAME AND COVER – SECURED EACH

The work under this Item will conform to the relevant provisions of Subsections 201, 220 and the following:

The work to be done under this Item consists of the furnishing and delivering Frame and Cover – Secured to the site as shown on the Plans, and as directed by the Engineer.

Frame and Cover - Secured assemblies shall consist of covers and frames that conform to the nominal size, weight, material and load-carrying requirements in MassDOT Construction Standard Details 221.0.1, 221.0.2 and 221.0.3, and are on the relevant MassDOT Qualified Construction Materials list. Some dimensions of secured manhole covers and frames may vary slightly from those shown on the standard details to account for necessary fastening components. The Contractor shall submit shop drawings of all drainage castings for approval prior to ordering.

Covers and frames will be held securely together by bolting to threaded holes in the frame or to nuts or tumbler devices secured by the frame, by use of hooks attached to the cover or by any other means approved by MassDOT, to prevent being dislodged under traffic loading. Gaskets and other sealing devices will not be allowed.

METHOD OF MEASUREMENT

Item 221.1 will be measured for payment per EACH Frame and Cover – Secured furnished and delivered to the site.

BASIS OF PAYMENT

Item 221.1 will be paid for at the Contract unit price per EACH Frame and Cover – Secured furnished and delivered.

ITEM 272.12 12 INCH AND UNDER PIPE REMOVED AND DISPOSED FOOT
ITEM 272.15 15 INCH PIPE REMOVED AND DISPOSED FOOT

The work under these Items shall conform to the relevant provisions of Subsection 270 of the Standard Specifications and the following:

The work under these Items shall consist of the removal and satisfactory disposal of the designated pipe structures of diameters 12 inches and under, or other sizes as noted, as indicated on the plans, and as required by the Engineer. After removal, exposed pipe ends and/or structure openings shall be plugged and the trench shall be backfilled.

CONSTRUCTION

A trench of sufficient width and depth shall be excavated so that the present pipe can be removed.

All joints shall then be opened and the pipe removed in its original sectional lengths.

Disposal of the removed pipe shall be at the expense of the Contractor.

Trench excavations for pipe removal shall be backfilled in conformance with the relevant provisions of Subsection 150.64 of the Standard Specification.

METHOD OF MEASUREMENT

Items 272.12 and 272.15 will be respectively measured for payment by the FOOT of pipe removed and disposed.

BASIS OF PAYMENT

Items 272.12 and 272.15 will be paid for at the respective Contract unit price per FOOT, which prices shall include all labor, materials, tools, equipment, and all incidental costs, including disposal, required to complete the work.

ITEM 299.97 STORMWATER BMP 1 LUMP SUM
ITEM 299.971 STORMWATER BMP 2 LUMP SUM

The work under this Item shall conform to the relevant provisions of Subsections 200 and 700 of the Standard Specifications and the following:

The work to be done under this item shall include installation of the two surface BMPs, as shown on the plans.

BEST MANAGEMENT PRACTICES AREA 1

Installation of all aspects of BMP 1 shall be considered incidental to this item, with no separate payment. BMP 1 can be found between stations 206+00 – 209+00 from the guardrail to the limit of grading shown on the Contract drawings.

The item includes, but is not limited to, the following:

Installation Stormwater BMP 1

ITEM	Unit	Quantity
Excavation	CY	610
Modified rock fill (12” depth)	TON	20
Geotextile fabric for separation under modified rock fill	SY	50
Crushed stone (12" depth) (Stone for underdrain Item 269.04)	CY	15
Vegetated infiltration seed mix (Wetland Mix - Seasonally Flooded 765.554)	LB	6
6” HDPE (Item 269.06)	FT	300
Loam Borrow (Item 751.1)	CY	140
Gravel Borrow (Item 151.)	CY	15
Granite Curb (Item 506.)	FT	125
Jute Mesh (Item 767.9)	SY	1,100

The vegetated infiltration seed mix is to be applied to all area of the basins and grass channel defined by the proposed contours, which is not identified for coverage by modified rock fill or granite curb, as indicated on the contract drawings.

BEST MANAGEMENT PRACTICES AREA 2

Installation of all aspects of BMP 2 shall be considered incidental to this item, with no separate payment. BMP 2 can be found between stations 268+00 – 270+50 from the back of SUP to the limit of grading shown on the Contract drawings.

ITEM 299.97 and 299.971 (Continued)

The item includes, but is not limited to, the following:

Installation Stormwater BMP 2

ITEM	Unit	Quantity
Excavation	CY	20
Modified rock fill (12" depth)	TON	15
Geotextile fabric for separation under modified rock fill	LB	30
Vegetated infiltration seed mix (Wetland Mix - Seasonally Flooded 765.554)	LB	4
Vegetated checkdam seed mix (Wetland Mix - Riparian 765.553)	SY	2
Loam Borrow (Item 751.1)	CY	120
Gravel Borrow (Item 151.)	CY	10
Granite Curb (Item 506.)	FT	100
Jute Mesh (Item 767.9)	SY	2,400

The vegetated infiltration seed mix is to be applied to all area of the basins and grass channel defined by the proposed contours, which is not identified for coverage by modified rock fill or granite curb, as indicated on the contract drawings.

BASIS OF PAYMENT

Items 299.97 and 299.971 will be paid for at their respective Contract lump sum prices for installation of each BMP area complete in place, including all soil, seed and vegetation mixes, excavation, support of excavation, filter fabric, crushed stone, rock fill, drainage structures, pipes and end sections, removal of existing pipe and all incidental costs required to complete the work. Please see Item 765.554 for specification for seeding amounts.

ITEM 302.10 10 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET) FOOT

The work under this item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

The 10 Inch Ductile Iron Water Pipe (Rubber Gasket) indicated on the plans shall be Class 52, cement-lined, ductile iron pipe, push-on, gasketed, type joint. All direction changes (horizontal and vertical), such as bends and tees; and connections of pipes, such as solid sleeves, gate valves, reducers, and end caps; shall be mechanical joint fittings including restrained glands. All bends, tees and end caps shall be installed with concrete thrust blocks.

The Contractor shall coordinate all temporary service needs with the Hopedale Water and Sewer Department. The Contractor shall coordinate all disinfection and testing of installed water systems with the Hopedale Water and Sewer, so they may be present onsite during these activities.

METHOD OF MEASUREMENT

Item 302.10 will be measured for payment per Foot of 10 Inch ductile iron water pipe (Rubber Gasket) installed complete in place.

BASIS OF PAYMENT

Item 302.10 will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work, as shown on the plans or as directed by the Engineer.

No separate payment will be made for the cost of the lining, but all costs shall be included in the unit price bid for this item.

ITEM 309. DUCTILE IRON FITTINGS FOR WATER PIPE POUND

The work under this item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

The Ductile Iron Fittings for Water Pipe shall conform to the requirements of AWWA C110 or C153 as appropriate and shall be of a pressure classification at least equal to that of the pipe with which they are used. Joints and gaskets shall conform to AWWA C111.

The Mechanical Joints shall be furnished with ductile iron follower glands, or megalugs if specified. Fittings shall be double cement-lined and seal-coated inside and out in accordance with AWWA C104.

All ductile iron pipe and fitting shall be clean, sound, and without defects. The castings shall be smooth and free from pinholes, excess iron, etc. The coatings shall be continuous, smooth and neither brittle nor sticky.

METHOD OF MEASUREMENT

Item 309. will be measured for payment by the Pound of ductile iron fittings for water pipe, furnished and installed, complete in place.

BASIS OF PAYMENT

Item 309. will be paid for at the Contract unit price per Pound, which price shall include furnishing, installation, all labor, materials, tools, equipment, and all incidental costs required to complete the work.

The weight of fittings up through 64 inch sized shall be measured and paid for as a compact ductile iron fittings (body weight only.

ITEM 316.10 10 INCH WATER MAIN REMOVED AND DISPOSED FOOT

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications, American Water Works Association (AWWA) standards and the following:

All water mains to be removed or abandoned shall be physically removed and disposed of by the Contractor. Any water main to be removed or abandoned shall be cut at its connection to a live main and physically disconnected. A watertight ductile iron cap with concrete backing shall be installed on the live main. If a gate valve or corporation stop exists at the connection, it shall be closed.

A trench of sufficient width and depth shall be excavated so that the present pipe can be removed.

All joints shall then be opened and the pipe removed in its original sectional lengths.

Disposal of the removed pipe shall be at the expense of the Contractor.

The Contractor shall notify impacted residents in person the day before about any shutdowns to their water services with approximate times. The Contractor shall coordinate all temporary service needs with the HWSD and notify the HWSD 24 hours in advance of any temporary shutdowns. The Contractor shall coordinate all disinfection and testing of installed water systems with the HWSD, so they may be present onsite during these activities.

Trench excavations for pipe removal shall be backfilled in conformance with the relevant provisions of Subsection 150.64.

METHOD OF MEASUREMENT

Item 316.10 will be measured for payment by the FOOT of pipe removed and disposed.

BASIS OF PAYMENT

Item 316.10 will be paid for at the Contract unit price per FOOT, which price shall include all labor, materials, tool, equipment, and all incidental costs, including disposal, required to complete the work.

ITEM 371.10 **10 INCH COUPLING** **EACH**

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications, American Water Works Association (AWWA) standards and the following:

The Contractor shall furnish and install couplings, appurtenant materials, and equipment to complete the work per the contract details, in accordance with the requirements of the Town of Hopedale Water and Sewer Department (HWSD), and as herein specified.

Pipe ends shall be cleaned thoroughly prior to installation. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferable by use of a torque wrench of the approximate size and torque for the bolts. The correct torque as indicated by a torque wrench shall not exceed 90 foot-lb.

The Contractor shall notify impacted residents in person the day before about any shutdowns to their water services with approximate times. The Contractor shall coordinate all temporary service needs with the HWSD and notify the HWSD 24 hours in advance of any temporary shutdowns. The Contractor shall coordinate all disinfection and testing of installed water systems with the HWSD, so they may be present onsite during these activities.

METHOD OF MEASUREMENT

Item 371.10 will be measured for payment by the EACH 10 Inch Coupling installed, complete in place.

BASIS OF PAYMENT

Item 371.10 will be paid for at the Contract unit price per EACH, which price shall include all labor, materials, tool, equipment, and all incidental costs, including disposal, required to complete the work.

ITEM 376.4 HYDRANT – REMOVED AND DISCARDED EACH

The work under this item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

All hydrants and cisterns to be removed or abandoned shall be physically removed and disposed of by the Contractor. Any hydrant or cistern to be removed or abandoned shall be cut at its connection to a live main and physically disconnected. A watertight ductile iron cap with concrete backing shall be installed on the live main. If a gate valve or corporation stop exists at the connection, it shall be closed.

METHOD OF MEASUREMENT

Item 376.4 will be measured for payment by the EACH hydrant removed and discarded.

BASIS OF PAYMENT

Item 376.4 will be paid for at the Contract unit price per EACH, which price shall include all labor, equipment, material, and all incidental costs required to complete the work.

ITEM 376.5 HYDRANT ADJUSTED EACH

The work under this item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications, American Water Works Association (AWWA) standards and the following:

Hydrants indicated on the Plans shall be adjusted to meet the proposed grade, where grade adjustments less than or equal to six (6) inches are required. Existing hydrant assemblies shall be retained.

The Contractor shall notify impacted residents by hand the day before about any shutdowns to their water services with approximate times. The Contractor shall coordinate all temporary service needs with the Town of Hopedale Water and Sewer Department (HWSD) and notify the HWSD 24 hours in advance of any temporary shutdowns. The Contractor shall coordinate all disinfection and testing of installed water systems with the HWSD, so they may be present onsite during these activities.

METHOD OF MEASUREMENT

Item 376.5 will be measured for payment by EACH Hydrant Adjusted, complete in place.

BASIS OF PAYMENT

Item 376.5 will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work, as shown on the plans or as directed by the Engineer.

ITEM 620.133 GUARDRAIL, TL-3 (SINGLE FACED, NESTED) FOOT

The work under these items shall follow specifications under Subsection 601 and materials shall meet the requirements specified in the following subsections of Division III, M8.07.0, M8.07.1, M9.30.7 and M9.30.10

Work shall include the installation of nested guardrail from STA 274+00 to 278+00 LT along Route 16. This work shall include but not limited to labor, materials and any equipment required to install the guardrail.

Work shall include the installation of nested TL-3 guardrail on top of the single faced TL-3 guardrail.

METHOD OF MEASUREMENT

Item 620.133 will be measured for payment by the foot of Guardrail, TL-3 (Single Faced, Nested) installed complete in place.

BASIS OF PAYMENT

Item 620.133 shall be measured and paid for at the contract unit price per foot. This cost shall constitute full compensation for all labor, materials and equipment required for the satisfactory completion of the work described above as shown on the plans and/or as directed by the Engineer. All materials, labor and equipment required under Item 620.13 Guardrail. TL-3 (Single Faced) is paid for under Item 620.133.

ITEM 632.3. INDIVIDUAL POST REMOVED AND STACKED EACH

The work shall consist of the removing and stacking of exisitng posts. Posts stacked shall be stored at the Mendon Highway Department at 66 Providence Street, Mendon, MA 01756.

METHOD OF MEASUREMENT

Item 632.3. Individual Post Removed and Stacked will be measured per each post complete in place.

BASIS OF PAYMENT

Item 632.3, Individual Post Removed and Stacked, will be paid for at the Contract unit price per each iteam. This unit price shall include all labor, tools, materials, equipment and transportation required to complete the work to the satisfaction of the Engineer.

ITEM 655. CEDAR RAIL FENCE FOOT

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsection 600 of the Standard Specifications and the following:

The work under this item shall consist of the installation of cedar rail fence, as shown on the plans and as required by the Engineer.

SUBMITTALS

The Contractor shall submit to the Engineer for approval a complete set of shop drawings, showing the layout of all fencing, including bolt holes.

QUALITY ASSURANCE

Beams that contain unsound knots and shakes, excessive checking or other defects that may be detrimental to their structural integrity will be rejected and shall not be used in the proposed work.

MATERIALS

Wood posts and rails shall be Cedar Wood, or other approved Cedar species such as redwood cedar etc.

Rail and posts shall be cut to length and have bolt holes drilled before pressure treatment is applied. Precutting shall be accurately done as enlarging of the pre-drilled holes, or the boring of new holes, or the re-cutting of post and rail lengths, will not be permitted.

The lumber shall be in sound condition, free from worm holes, knots, longitudinal heart cracks, soft sap wood, fungus, and deformation (twisting or cupping) that cannot be removed during installation using normal installation methods and tools. Natural drying checks to a maximum of 1/8 inch width will be acceptable.

All connectors, fasteners, and hardware shall be either stainless steel type 304 or 316 alloy or shall be Hot-dip galvanized meeting the requirements of ASTM A153 and A123, with 2 ounces of zinc coating per square foot minimum. Fasteners, connectors, and hardware used together shall be of the same type.

EXECUTION

Posts shall be set plumb in excavated holes at the line and grade shown on the plans. Post holes shall be backfilled with gravel borrow or cement concrete if required minimum depth cannot be met and thoroughly compacted in layers not exceeding 12 inches in depth.

ITEM 655. (Continued)

The Contractor shall take care in the handling of the rails. Any damaged timbers shall be replaced by the Contractor at the discretion of the Engineer and at no additional cost.

Wood rails shall be erected to form a smooth continuous rail conforming to the required line and grade. Butt adjoining rail sections with a maximum separation between adjoining rail sections of 1/16 inch.

Rails shall be butt jointed at alternate posts or as directed. Hammering or other forceful method of inserting bolt shall not be used.

The Contractor is cautioned that within the limits of this project, buried cables for utilities, which may be energized, may be present.

METHOD OF MEASUREMENT

Item 655. Cedar Rail Fence shall be measured for payment by foot along the top rail from center to center of end posts, complete in place.

BASIS OF PAYMENT

Item 655. Cedar Rail Fence will be paid for at the contract unit bid price per foot complete in place, which price and payment shall be full compensation for providing, cutting, installing the timber, excavation and back fill, all labor, materials, transportation, equipment and all other work and expense incidental thereto and necessary to complete the work as required by the Engineer.

ITEM 665. CHAIN LINK FENCE REMOVED AND STACKED FOOT

The work under this item shall conform to the relevant provisions of Subsection 600 of the Standard Specifications and the following:

The work shall consist of the removing and stacking of exisitng Chain Link fence panels and posts. Chain Link panels and posts stacked shall be stored at Ron's Truck Caps, 17 Uxbridge RD, Mendon, MA 01756.

METHOD OF MEASUREMENT

Item 665. Chain Link Fence Removed and Stacked will be measured for payment per foot, complete in place.

BASIS OF PAYMENT

Item 665., Chain Link Fence Removed and Stacked, will be paid for at the Contract unit price per foot,which price shall include all labor, tools, materials, equipment, transportation and all incidental costs required to complete the work as required by the Engineer.

ITEM 669. FENCE REMOVED AND STACKED FOOT

The work under this item shall conform to the relevant provisions of Subsection 600 of the Standard Specifications and the following:

The work shall consist of the removing and stacking of exisitng fence panels and posts. Fence panels and posts stacked shall be stored at the Mendon Highway Department at 66 Providence Street, Mendon, MA 01756.

METHOD OF MEASUREMENT

Item 669. Fence Removed and Stacked will be measured for payment per foot complete in place.

BASIS OF PAYMENT

Item 669. Fence Removed and Stacked, will be paid for at the Contract unit price per foot. This unit price shall include all labor, tools, materials, equipment, transportation and all incidental costs required to complete the work as required by the Engineer.

ITEM 669.1 FENCE REMOVED AND DISPOSED FOOT

The work under this Item shall conform to the relevant provisions of Subsection 600 of the Standard Specifications and the following:

Work under this item shall include the removal of existing fence as shown on the plans or as required by the Engineer. The work under this Item shall also include the excavation of foundations (if any), disposal of the concrete, backfilling with compacted gravel of the holes resulting from foundation excavation. As shown on the plans and as directed by the Engineer, all existing fences and posts shall be removed and discarded.

METHOD OF MEASUREMENT

ITEMS 669.1 will be measured for payment by the FOOT of fence removed and properly disposed.

BASIS OF PAYMENT

Item 669.1 will be paid for at the Contract unit price bid per FOOT, which price shall include removal and disposal of the existing fences and posts, in the locations shown on the plans, and all incidental costs required to complete the work.

ITEM 685. STONE MASONRY WALL CUBIC YARD

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsection 685 of the Standard Specifications and the following:

The work under this item shall consist of the installation of Stone Masonry Walls, as shown on the plans and as required by the Engineer.

In supplement to the standard special provisions, Contractor will take one boring with a depth of 15 feet at each wall spaced a maximum 100 feet apart for any wall 5 feet or higher (top of wall to bottom of footing) and longer than 50 feet to ensure local soil conditions meet the MassDOT standard footing and wall detail requirements provided in detail E 302.2.0.

Contractor will submit wall shop drawings for each stone moasonry wall and include boring logs for approval by the Engineer prior to commencment of work.

Stone masonry wall footing and coping shall be precast concrete. Contractor to provide shop drawings for review and approval prior to commencement of work.

METHOD OF MEASUREMENT

Item 685. Stone Masonry Wall will be measured per cubic yard complete in place. Excavation work including Item 141: Class A Trench Excavation and/or Item 144: Class B Rock Excavation are incidental to Item 685. Measurement shall be in accordance with the begin and end stations specified in this special provision and/or the construction plans.

BASIS OF PAYMENT

Item 685. Stone Masonry Wall, will be paid for at the contract unit price per cubic yard. This unit price will include all labor, tools, materials, equipment, transportation and all incidentals costs required to complete the work including cement concrete for footing and coping as required by the Engineer. Any borings needing to be done around wall locations will be incidental to the wall locations as shown on the plans. This includes all labor, materials and equipment necessary to complete the borings.

ITEM 690.01 HISTORIC STONE MASONRY WALLS REMOVED AND REBUILT FOOT

The work under this Item shall conform to the applicable provisions of Subsections 685, 690 and 901 of the Standard Specifications, the Plans, and the following:

DESCRIPTION

The work shall include the removal and resetting of the historic stone masonry retaining walls (Wall H and I) at STA 238+38 LT to STA 239+36 LT and STA 253+55 LT To STA 800+86 LT (North Ave). The walls are to be rebuilt using stones from the existing wall as shown on the plans. The work shall be sone in accordance with these specifications, and in close conformity with the lines and grades shown on the plans or established by the Engineer.

The stone walls shall be disassembled and reset by certified masons who, in the opinion of the Engineer, are experienced in this class of work. The contractor shall engage the services of a certified mason to supervise all work described in this item. The certified mason shall have at least 10 years' experience constructing stone walls, including documented experience reconstructing historic stone walls. The Engineer shall approve the credentials of the certified mason.

Any supplemental stones that are required shall be field stones that match the size, color, and texture of the existing stones, as closely as feasible.

The work shall include the disassembly of existing masonry, cleaning of existing masonry with a wire brush or with a low-pressure water hose and resetting masonry wall complete as shown on the plans and as directed by the Engineer. This shall include but not be limited to digging and trenching, labor, tools, equipment, supplemental stones, and all incidentals required to complete the work as stated herein, shown on the contract plans, and as directed by the Engineer to the satisfaction of the Engineer.

CONSTRUCTION METHODS

Prior to the disassembly of the existing stone wall, the certified mason shall photograph each wall in its existing location and condition to serve as a guide for resetting the new wall. Digital photographs shall be provided to the Engineer.

The walls shall be reset in such manner that they shall retain the dry laid stone appearance of the existing walls to be removed, with stones reset in approximately their original location within the wall. Proper raking is to take place when reconstructing the new stone walls and establishing the new mortar joints to maintain the existing dry laid appearance. The spaces between larger stones shall be chinked with small stones to firmly lock each stone in place and to fill the space as completely as possible.

Item 690.01 (Continued)

The Contractor shall accept and hold entire responsibility for the removal, handling, storage and subsequent resetting of the wall. Any stones damaged or lost either directly or indirectly as a result of the Contractor's operations shall be replaced by the Contractor for their in-kind replacement, matching dimensions, color, and texture with MassDOT Engineer approval, at no additional cost to MassDOT.

The excavated area behind the walls shall be backfilled with gravel borrow and compacted in conformance with MassDOT Subsections 150.60 and 150.62 of the Standard Specifications.

Stone masonry wall footing and coping shall be precast concrete. Contractor to provide shop drawings for review and approval prior to commencement of work is incidental to this item.

METHOD OF MEASUREMENT

Item 690.01 Historic Stone Masonry Walls Removed and Rebuilt will be measured for payment by the foot of Historic Stone Masonry Walls removed and rebuilt, complete in place. The quantity measured shall not exceed that shown on the plans.

BASIS OF PAYMENT

Item 690.01 Historic Stone Masonry Walls Removed and Rebuilt will be paid for at the Contract unit price per foot, which price shall include all labor, equipment, worker protection, environmental compliance, materials, material testing, and any incidentals required to complete the work to the satisfaction of the Engineer in accordance will all requirements of the contract. Any surplus stones shall become the property of the Contractor.

Any excavation required for the stone masonry walls will be incidental to Item 690.1.

ITEM 690.11 STONE MASONRY WALL REMOVED AND DISPOSED FOOT

The work under this item shall be done in conformance with Subsection 120 of the Standard Specifications and the following:

The work shall consist of removing and discarding existing stone wall, foundation elements etc. The existing foundation shall be removed to a depth of at least one foot below the existing ground within the project limits and within the state Right-of-Way.

Existing stone wall material disposal is the responsibility of the Contractor.

METHOD OF MEASUREMENT

Item 690.11 will be measured for payment by Foot of existing stone masonry wall removed and disposed regardless of height of wall.

BASIS OF PAYMENT

Item 690.11 will be paid for at the contract unit price per Foot, which price shall include all labor, materials, equipment, excavation, restoration or replacement in kind of disturbed surfaces and incidental costs required to complete the work.

Disposal of existing wall material is the responsibility of the Contractor. No additional payment for offsite disposal is included.

ITEM 690.12 FLAGSTONE LANDSCAPE WALL REMOVED AND REBUILT SQUARE FOOT

The work under this item shall conform to the relevant provisions of Subsections 690 of the Standard Specifications and the following:

The work shall include the removing and rebuilding of flagstone landscape balance wall, potential new flagstone and Morter which Mortar shall meet the requirement of M4.02.15: Cement Mortar.

MATERIALS AND CONSTRUCTION

Contractor to organize the flagstone roughly by shape and size and chisel as necessary. Establish a level line and excavate the area 12 inches. Contractor to place geotextile fabric and ensure 6 inches of overlap in front of the wall. Overlap adjacent strips of fabric by 6 inches. The base of the wall shall be 6 inches of gravel borrow type b and compacted. Set the wall in course layers and backfill the wall every 12 inches of new wall height.

METHOD OF MEASUREMENT

Item 690.12 will be measured for payment per square foot of Flagstone Landscape wall removed and rebuilt as required by the Engineer.

BASIS OF PAYMENT

Item 690.12 will be paid for at the contract unit price per square foot which price shall include all labor, materials, equipment, excavation, restoration or replacement in kind of disturbed surfaces and all incidental costs required to complete the work.

Excavation at the new location will be paid for at the contract unit price per cubic yard under the item 141.Class A Trench Excavation or item 142.Class B Trench Excavation.

Cement mortar, labor, materials to construct the wall, stockpiling, gravel borrow type b, geotextile fabric etc. is incidental to Item 690.12.

ITEM 690.13. FLAGSTONE LANDSCAPE WALL REMOVED AND STACKED FOOT

The work under this item shall conform to the relevant provisions of Subsection 690 of the Standard Specifications and the following:

The work shall consist of the removing and stacking of exisitng Flagstone Landscape Wall. and shall be stored at the Mendon Highway Department at 66 Providence Street, Mendon, MA 01756.

METHOD OF MEASUREMENT

Item 690.13. Flagstone Landscape Wall Removed and Stacked will be measured for payment per foot of Flagstone Landscape Wall Removed and Stacked..

BASIS OF PAYMENT

Item 690.13, Flagstone Landscape Wall Removed and Stacked, will be paid for at the Contract unit price per footwhich price shall include all labor, tools, materials, equipment and transportation required to complete the work as required by the Engineer.

ITEM 691.01 HISTORIC MORTARED STONE RAILING WALLS REMOVED AND RESET FOOT

The work under this Item shall conform to the relevant provisions of Subsections 685, 690, 901, of the Standard Specifications, the Plans, and the following:

The work under this Item consists of carefully removing and resetting the existing historic mortared stone railing walls at the southerly end of the walkway in front of 21 Hastings Street at STA 242+60 LT. The work shall be done in accordance with these specifications, and in close conformity with the lines and grades shown on the plans or established by the Engineer. The reset stone railing walls shall maintain the appearance and character of the existing historic mortared stone railing walls to the greatest extent feasible.

The stone railing walls shall be removed and reset by certified masons who, in the opinion of the Engineer, are experienced in this class of work. At least one of the masons shall have 10 years or more experience constructing mortared stone walls.

The work shall include the disassembly of existing masonry, cleaning of existing masonry with a wire brush or with a low-pressure water hose, and resetting masonry wall complete as shown on the plans and as directed by the Engineer. This shall include but not be limited to digging and trenching, labor, tools, equipment, supplemental stones, and all incidentals required to complete the work as stated herein, shown on the contract plans, and as directed by the Engineer to the satisfaction of the Engineer.

CONSTRUCTION METHODS

The mason shall provide digital color photographs of both stone railing walls to the Engineer showing all sides of each wall in its current position, including the four end posts. Close-up photos shall show typical mortar joints and any damaged areas. The mason shall determine the dimensions of the mortared stone railing walls, including the height and circumference of the end posts, which shall be approved by the Engineer. The mason shall determine the typical width and depth of the mortar joints.

The certified masons shall carefully disassemble each wall to avoid damaging any of the existing stones. The stones from each wall shall be stacked in separate piles and shall be reused to reset the same wall at the new location. The mason shall ensure that each stone is cleaned of old mortar to the greatest extent feasible.

If the walls are not immediately reset on the new alignments after disassembly, the Contractor shall provide a secure location for stockpiling the stones so that the stones will not be damaged, lost, or stolen. The Engineer shall approve the secure storage location.

Item 691.01 (Continued)

The mason shall determine the most appropriate footing for each stone railing wall in its new location, which shall be approved by the Engineer. The mason shall determine the most appropriate mortar and infill to be used for resetting the stone railing walls, which shall be approved by the Engineer. The color of the new mortar shall match the existing color to the greatest extent feasible. The depth, width, and tooling of mortar joints shall match the existing as closely as feasible.

The walls shall be reset using stones salvaged from the corresponding existing walls. The new walls shall match the dimensions of the existing walls based on the photographs and measurements taken by the mason. Any supplemental stones needed to replace broken or missing stones or to augment the new construction shall match the size, color, and texture of the existing stones. Supplemental stones shall be approved by the Engineer. The open spaces around the base of each new wall shall be filled with clean soil excavated from the trench or new topsoil.

METHOD OF MEASUREMENT

Item 691.01. Historic Mortared Stone Retaining Walls Removed and Reset will be measured for payment per foot of Historic Mortared Stone Retaining Walls Removed and Reset.

BASIS OF PAYMENT

Item 691.01, . Historic Mortared Stone Retaining Walls Removed and Reset, will be paid for at the Contract unit price per foot, which price shall include all labor, equipment, worker protection, environmental compliance, materials, tools, material testing, and all incidental costs required to complete the work as required by the Engineer.

Any surplus stones shall become the property of the Contractor and removed and discarded offsite at no additional cost to MassDOT.

ITEM 691.2 HISTORIC STONE BALANCE WALLS REMOVED AND RESET FOOT

The work under this Item shall conform to the relevant provisions of Subsections 685, 690, 901, of the Standard Specifications, the Plans, and the following:

The work under this Item consists of carefully removing, storing, and resetting the existing historic dry-laid stone balance walls at:

STA 258+50 LT TO STA 261+34 LT
STA 261+55 LT TO STA 263+65 LT
STA 262+15 RT TO STA 262+75 RT
STA 257+85 LT TO STA 261+35 LT

The work shall be done in accordance with these specifications, and in close conformity with the lines and grades shown on the plans or established by the Engineer. The reset wall shall maintain the appearance and character of the existing historic dry-laid stone balance wall to the greatest extent feasible.

The stone walls shall be disassembled and reset by certified masons who, in the opinion of the Engineer, are experienced in this class of work. The contractor shall engage the services of a certified mason to supervise all work described in this item. The certified mason shall have at least 10 years' experience constructing stone walls, including documented experience reconstructing historic stone walls. The Engineer shall approve the credentials of the certified mason.

The work shall include the disassembly of existing masonry, cleaning of existing masonry with a wire brush or with a low-pressure water hose, and resetting masonry wall complete as shown on the plans and as directed by the Engineer. This shall include but not be limited to digging and trenching, labor, tools, equipment, supplemental stones, and all incidentals required to complete the work as stated herein, shown on the contract plans, and as directed by the Engineer to the satisfaction of the Engineer.

CONSTRUCTION METHODS

Prior to the commencement of work of the existing stone walls, the certified mason shall photograph the walls in their existing location and condition to serve as a guide for resetting the new walls. Digital photographs shall be provided to the Engineer.

The fieldstones in the wall shall be salvaged for reuse in the new wall. All stones shall be carefully handled and stored during construction to limit surface damage. If an excavator, backhoe, or similar equipment is required for removal of the stones, the bucket shall be adequately padded to avoid surface damage to the stones. If any stones are lost or broken during disassembly, storage, or resetting, the Contractor shall be responsible for their in-kind replacement, matching dimensions, color, and texture with MassDOT Engineer approval, at no additional cost to MassDOT.

Item 691.2 (Continued)

All stones shall be brushed clean or cleaned with low pressure water hose to remove surface dirt, grime, and plant material before storage or resetting. Pressurized grit blasting, such as sand blasting, shall not be used.

If the walls are not immediately reset on their new alignment after disassembly, the Contractor shall provide a secure location for stockpiling the stones so that the stones will not be damaged, lost, or stolen. The Engineer shall approve the secure storage location.

Prior to resetting each new stone balance wall, a trench for rebuilding the wall shall be excavated along the specified line to a minimum depth of 12 in. and to a width sufficient to place the largest bottom stones from the existing wall, as directed by the Engineer. The trench shall be filled with gravel borrow or its equivalent, as approved by the Engineer, to provide a stable foundation on which to reset the stone wall. The wall shall be reset using stones salvaged from the existing wall. The new wall shall match the dimensions of the existing wall with stones reset in approximately the same location and orientation as within the existing wall, based on the photographs. Any supplemental stones shall match the size, color, and texture of the existing stones. Supplemental stones shall be approved by the Engineer. The spaces between larger stones shall be chinked with small stones to firmly lock each stone in place and to fill the space as completely as possible. The open spaces around the base of the wall shall be filled with clean soil excavated from the trench or new topsoil.

METHOD OF MEASUREMENT

Item 691.2 will be measured for payment by the foot of Historic Stone Balance Wall removed and reset price complete in place.

BASIS OF PAYMENT

Item 691.2 will be paid for at the Contract unit price per foot, which price shall include all labor, equipment, worker protection, environmental compliance, materials, tools, material testing, and any incidentals required to complete the work to the satisfaction of the Engineer in accordance will all requirements of the contract. Any surplus stones shall become the property of the Contractor.

Excavation at the new location will be paid under Items 140 Class A Trench excavation or 142. Class B trench excavation.

Any surplus stones shall become the property of the Contractor and removed and discarded offsite at no additional cost to MassDOT.

ITEM 697.1 SILT SACK EACH

Work under this item shall conform to the relevant provisions of Subsections 227 and 670 of the Standard Specifications and the following:

The work under this item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed & Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

CONSTRUCTION METHODS

Silt sacks shall be installed in retained existing and proposed catch basins and drop inlets within the project limits and as required by the Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as required by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the Contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractor's expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb inlet openings shall be blocked to prevent stormwater from bypassing the device.

All debris accumulated in silt sacks shall be handled and disposed of as specified in Section 227 of the Standard Specifications.

ITEM 697.1 (Continued)

COMPENSATION

Silt sacks will be measured and paid at the Contract unit price per each, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 698.3 GEOTEXTILE FABRIC FOR SEPARATION SQUARE YARD

The work under this item shall conform to all relevant provisions of Subsection 260 of the Standard Specifications and the following:

The work under this item includes the furnishing and installation of geotextile fabric to be used under stone for pipe ends in front of drainage outlets and for separation underneath modified rockfill for slope protection, BMP check dams, and as directed by the Engineer.

MATERIALS

The geotextile fabric shall conform to the requirements of AASHTO M 288 - Class 2 for fabric used for separation. The fabric shall be a non-woven, needle punched, high survivability fabric. The fabric shall be an approved fabric from the MassDOT Qualified Construction Materials List, under Geotextile Fabrics (M 9.50.0) – for separation. The Geotextile fabric shall be a 12 ounce fabric and shall be used for:

- Stone for Pipe Ends
- Modified Rockfill

The geotextile shall be protected from exposure to sunlight during transport and storage. Atmospheric exposure of the geotextile fabric to the elements following lay down shall be a maximum of 14 days. If laid under water, the covering rock fill shall be placed on the same day as the geotextile.

CONSTRUCTION METHODS

The work under this Item shall include the placement of geotextile fabric along the sides and bottom of the subgrade. The overlap between any adjoining pieces of fabric shall be at least 2-feet.

METHOD OF MEASUREMENT

Item 698.3 will be measured for payment by the Square Yard, complete in place; any overlaps shall be measured as a single layer of cloth.

BASIS OF PAYMENT

Item 698.3 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, tools, material, equipment and all incidental costs required to complete the work.

ITEM 701.3 MODIFICATIONS TO CONCRETE WALK AND RAILINGS LUMP SUM

The work under this Item shall conform to the relevant provisions of Subsections 701 and 901 of the Standard Specifications, Massachusetts Building Code (latest edition), ADA/AAB regulation, the plan details and the following:

The work involved includes removing a portion of existing ground and sidewalk to construct and grade a new set of stairs, concrete walk, and railing. The work shall include the reconstruction of the existing concrete walkway with rails. The level landing shall have a detectable warning panel for the full width of the landing and a depth of 24-inches, as shown on the contract plans. The warning panels shall be yellow in color. Panel to abut back of proposed sidewalk.

DIG SAFE to be notified prior to any construction.

RAILING
Contractor to provide two picket #3 handrails for 3 steps on each side of the stairs. The handrail shall measure 3 feet, post to post. This handrail will cover: 3 Risers 5¼" to 10¼" Tall, 2 Treads 9¾" to 14¼", Deep and Picket #3 measures 36" center-to-center of posts.

The handrail will be wrought iron with a powder coated matte black finish.

Contractor to provide four bolts into concrete per post. Bolt size to be determined by railing manufacturer.

CONCRETE STAIRS AND WALKWAY
Concrete will meet the requirements of Item 701.

SHOP DRAWING
Contractor to submit a shop drawing of new set of stairs, concrete walk and railing details for approval by engineer prior to installation. A shop drawing shall be prepared for each location including but not limited to:

STA 235+49 O/S LT	STA 252+36 O/S LT
STA 244+27 O/S LT	STA 253+41 O/S RT
STA 245+28 O/S LT	STA 299+17 O/S RT

BASIS OF PAYMENT

Item 701.3 shall be Paid for at the contract unit price per LUMP SUM and which price shall include all excavation, disposal, forms, concrete, reinforcing steel, cement concrete walk surfaces, cement concrete ramps, detectable warning panel, site grading, loam and seed, railing removing and resetting of existing fence and railing installation required to complete the work as required by the Engineer.

ITEM 706.11 BRICK WALK REMOVED AND STACKED SQUARE YARD

The work under this item shall conform to the relevant provisions of Subsection 700 of the Standard Specifications and the following:

The work shall consist of the removing and stacking of brick walk. Bricks stacked shall be stored at the Mendon Highway Department at 66 Providence Street, Mendon, MA 01756.

METHOD OF MEASUREMENT

Item 706.11 Brick Walk Removed and Stacked will be measured per square yard of Brick Walk removed and Stacked.

BASIS OF PAYMENT

Item 706.11, Brick Walk Removed and Stacked, will be paid for at the Contract unit price per square yard which price shall include all labor, tools, materials, equipment, transportation and all incidental costs required to complete the work as required by the Engineer.

ITEM 706.4 GRANITE STEPS REMOVED AND RESET LUMP SUM

The work under this Item shall conform to the applicable provisions of Subsections 501 and 901 of the Standard Specifications, the Plans, and the following:

DESCRIPTION

The work under this Item consists of carefully removing, storing, and resetting the existing. granite steps at STA 244+30 LT (Route 16) at 19 Hastings Street. The work shall be done in accordance with these specifications, and in close conformity with the lines and grades shown on the plans or established by the Engineer.

The work shall include the disassembly of existing granite steps, cleaning of existing granite steps with a wire brush or with a low-pressure water hose and resetting the granite steps to complete as shown on the plans and as directed by the Engineer. This shall include but not be limited to digging and trenching, labor, tools, equipment, supplemental granite steps, and all incidentals required to complete the work as stated herein, shown on the contract plans, and as directed by the Engineer to the satisfaction of the Engineer.

CONSTRUCTION METHODS

Prior to the disassembly of the existing granite steps the Contractor shall photograph the steps in its existing location and condition to serve as a guide for resetting the new steps. Photos shall clearly show the location and condition of each granite step. Digital photographs shall be provided to the Engineer.

The granite steps shall be removed, and each step shall be marked on the bottom side with a number in sequential order to ensure that the steps are reset on the new location with the top step in the existing conditions as the top step in the new proposed location. All granite steps shall be carefully handled and stored during construction to limit surface damage. If an excavator, backhoe, or similar equipment is required for removal of the steps, the bucket shall be adequately padded to avoid surface damage to the granite. If any steps are lost or broken during disassembly, storage, or resetting, the Contractor shall be responsible for their in-kind replacement, matching dimensions, color, and texture, at no additional cost to MassDOT.

All granite steps shall be brushed clean or cleaned with low pressure water hose to remove surface dirt, grime, and plant material before storage or resetting. Pressurized grit blasting, such as sand blasting, shall not be used.

If the steps are not immediately reset at the new location after disassembly, the Contractor shall provide a secure location for stockpiling the granite steps so that the granite steps will not be damaged, lost, or stolen. The Engineer shall approve the secure storage location.

Item 706.4 (Continued)

Prior to resetting the new granite steps a footing pad for rebuilding the steps shall be excavated along the specified area to a minimum depth of 12 inches. and to a width sufficient to place the largest bottom step, as directed by the Engineer. The trench shall be filled with gravel borrow or its equivalent, as approved by the Engineer, and then compacted to provide a stable foundation on which to reset the granite steps. The steps shall be reset using the existing granite steps from the existing location. Any supplemental granite steps shall be fieldstones that match the size, color, and texture. of the existing steps. Any supplemental granite steps shall be approved by the Engineer and will be incidental to the item at no additional cost to MassDOT.

When setting the new granite steps, the steps shall be placed on the level gravel burrow surface and sloped towards the roadway following ADA standards and meet MAAB regulations. The contractor is to ensure that the height between each step does not exceed 6" and a thread of 12" per MassDOT standards. A level landing of a minimum of 20" shall be provided at the top and bottom of the complete set of granite steps using concrete. The concrete shall be a minimum of 4" thick and shall be 4000 psi, 3/4", 610 Cement Concrete, and shall conform to the requirements of Section M4.02.00 of the MassDOT Standard Specifications. The open spaces around the edges of the granite steps shall be filled with clean soil excavated from the footing pad or new topsoil and reseeded.

The existing wrought iron railings shall be removed, repainted, and reset at the new location. If the existing wrought iron railings cannot be reused, the Contractor shall provide new wrought iron railings that match the existing as closely as feasible.

BASIS OF PAYMENT

Item 706.4 Granit Steps Removed and Reset shall be paid for at the Contract unit price per lump sum price for which price shall include full compensation for, including, but not limited to, all labor, equipment, worker protection, environmental compliance, materials, tools, material testing, and any incidentals required to complete the work as required by the Engineer.

All excavation work required to create the new footing pad as well as excavation around the existing steps to ensure there is no damage while disassembling shall be included with the lump sum.

ITEM 706.5 FIELD STONE WALK REMOVED AND RESET SQUARE YARD

The work under this Item shall conform to the relevant provisions of Subsection 701 of the Standard Specifications and the following: Work shall consist of the furnishing and construction of flagstone walk in close conformity with the lines and grades shown on the Plans or established by the Engineer.

The work shall consist of the removing and relaying of fieldstone, similar to the existing conditions and in close conformity with the lines and grades shown on the Plans or as required by the Engineer. Fieldstones should be set on a tampered gravel base. Once Fieldstones are set in place according to the plans, Contractor to brush sand overtop of the Fieldstones to lock into place.

METHOD OF MEASURMENT

Item 706.5 Fieldstone Walk Removed and Reset will be measured for payment per square yard of field stone remove and reset, complete in place.

BASIS OF PAYMENT

Item 706.5 Fieldstone Walk Removed and Reset, will be paid for at the Contract unit price per square yard. which price shall include all labor, tools, materials, equipment, transportation and all incidental costs required to complete the work as required by the Engineer.

ITEM 714.01 MONUMENT REMOVED AND RESET #1 LUMP SUM
ITEM 714.02 MONUMENT REMOVED AND RESET #2 LUMP SUM

The work under this item shall conform to the relevant provisions of Subsection 700 of the Standard Specifications and the following:

The work shall include the removal and resetting of the historic monument and/or memorial at approximate Station 240+67 RT and Station 242+90 RT within the State Highway Layout. Coordinate with the Town of Mendon for exact location. Backfill hole with 12" of gravel borrow and 6" of crushed stone.

CONSTRUCTION METHOD
Care shall be taken not to damage the existing monuments.

The monument at Sta. 240+67 RT shall be paid for under Item 714.01 and referenced as Monument #1. Material to be removed and reset includes:

- Solar lights
- Granite Monument
- 2" black pebbles
- Sloped Granite Edging

Materials for Monument #1 that shall include:
- Cement Concrete Pad
- Artificial Turf
- 1" steel dowl for pinning monument
- Crushed Stone & Gravel Borrow

The monument at Sta. 242-90 RT shall be paid for under Item 714.02 and referenced as Monument #2. Material to be removed and reset includes:

- Granite Walls & Posts
- Monument Statue

Materials for Monument #2 that shall be new include:
- Cement Concrete Pad
- Loam and Seed
- Joint Sealant for natural stone
- Crushed Stone & Gravel Borrow

SHOP DRAWINGS
Contractor shall submit shop drawings (per the construction details) of the removal and resetting of the monuments including:
- Removal procedure
- Footing design
- Temporary stacking locating if required

ITEM 714.01 & 714.02 (Continued)

- Proposed location with coordinates and written approval from the Town

BASIS OF PAYMENT

Item 714.01 and 714.02 will be paid for at the Contract unit price lump sum, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

Upon removal, any damage to the monument and/or materials associated such as turf grass, solar lighting, underground power cable etc. shall be replaced in kind by the Contractor at no additional price to MassDOT.

Final payment for Item 714.01 & 714.02 is to be paid upon written approval of relocation with agreement from MassDOT, The Engineer and the Town of Mendon.

ITEM 715.53 REMOVE AND STACK LANDSCAPE BOULDERS EACH

The work under this item shall conform to the relevant provisions of Subsection 710 of the Standard Specifications and the following:

The Contractor shall provide all materials and equipment and do all work necessary to remove and stack landscaped boulders where indicated on the plans and as required by the Engineer.

CONSTRUCTION METHOD

Care shall be taken not to mar or damage the natural, weathered surfaces of the boulders. Any boulder which, in the opinion of the Engineer, is sufficiently damaged to detract from its appearance, shall be replaced in kind at no additional expense to MassDOT.

Contractor shall stack boulders at the Mendon Highway Department (66 Providence St., Mendon, MA 01756)

METHOD OF MEASUREMENT

Item 715.53 shall be measured per Each landscaped boulder removed and stacked.

BASIS OF PAYMENT

Item 715.53 will be paid for at the contract unit price per Each, which price shall be full compensated for removing and stacking landscape boulders and transporting boulder to the Mendon highway department.

ITEM 715.54 REMOVE AND RESET LANDSCAPE BOULDERS EACH

The work under this item shall conform to the relevant provisions of Subsection 710 of the Standard Specifications and the following:

The Contractor shall provide all materials and equipment and do all work necessary to remove and reset landscaped boulders where indicated on the plans and as required by the Engineer.

CONSTRUCTION METHOD

Care shall be taken not to mar or damage the natural, weathered surfaces of the boulders. Any boulder which, in the opinion of the Engineer, is sufficiently damaged to detract from its appearance, shall be replaced in kind at no additional expense to MassDOT.

Boulders shall be set vertically into place. Boulders shall not be rolled or skidded over gravel cover, nor shall be dropped into place from a distance higher than 30 inches.

Embed approximatley ¼ of boulder to obtain natural appearance.

METHOD OF MEASUREMENT

Item 715.54 shall be measured per Each landscaped boulder removed and reset.

BASIS OF PAYMENT

Item 715.54 will be paid for at the contract unit price per Each, which price shall be full compensated for removing and resetting landscape boulders.

Equipment or excavation necessary for installing landscaped boulders shall be incidental to Item 715.54.

ITEM 740. ENGINEER' S FIELD OFFICE AND EQUIPMENT (TYPE A) MONTH

The work under this Item shall conform to the relevant provisions of Subsection 740 of the Standard Specifications and the following:

Three computer systems and printer system meeting minimum requirements set forth below including installation, maintenance, power, paper, disks, and other supplies shall be provided at the Resident Engineer's Office:

All equipment shall be UL approved and Energy Star compliant.

The Computer System shall meet the following minimum criteria or better:

Processor:	Intel, 3.5 GHz
System Memory (RAM):	12 GB
Hard Drive:	500 GB
Optical Drive:	DVD-RW/DVD+RW/CD-RW/CD+RW
Graphics Card:	8 GB
Network Adapter:	10/100 Mbit/s
USB Ports:	6 USB 3.0 ports
Keyboard:	Generic
Mouse:	Optical mouse with scroll, MS-Mouse compliant
Video/Audio	the computer system shall be capable of allow video calling and recording:
Video camera	shall be High Definition 1080p widescreen capable video calling and recording with built in microphone. The microphone system shall capture natural audio while filtering out background noise.
Audio	shall be stereo multimedia speaker system delivering premium sound.
OS:	Latest Windows Professional with all security updates
Web Browser:	Latest Internet Explorer with all security updates
Applications:	Latest MS Office Professional with all security updates Latest Adobe Acrobat Professional with all security updates Latest Autodesk AutoCAD LT Antivirus software with all current security updates maintained through the life of the contract.
Monitors:	Two 27" LED with Full HD resolution. Max. resolution 1920 x 1080
Flash drives:	2 (two) - 128GB USB 3.0
Internet access:	High Speed (min. 24 mbps) internet access with wireless router.

ITEM 740. (Continued)

The Multifunction Printer System shall meet the following minimum criteria or better:

Color laser printer, fax, scanner, email and copier all in one with the following minimum capabilities:

- Estimated volume 8,000 pages per month
- LCD touch panel display
- 50 page reversing automatic document feeder (RADF)
- Reduction/enlargement capability
- Ability to copy and print 11” x 17” paper size
- email and network pc connectivity
- Microsoft and Apple compatibility
- ability to overwrite latent images on hard drive
- 600 x 600 dpi capability
- 30 pages per minute print speed (color),
- 4 Paper Trays Standard (not including the bypass tray)
- Automatic duplexing
- Finisher with staple functions
- Standard Ethernet. Print Controller
- Scan documents to PDF, PC and USB
- ability to print with authenticated access protection

The Contractor shall supply a maintenance contract for next day service, and all supplies (toner, staples, paper) necessary to meet estimated monthly usage.

The Engineer's Field Office and the equipment included herein including the computer system, and printer shall remain the property of the Contractor at the completion of the project. Disks, flash drives, and card readers with cards shall become the property of the Department.

Compensation for this work will be made at the contract unit price per month which price includes full compensation for all services and equipment, and incidentals necessary to provide equipment, maintenance, insurance as specified and as directed by the Engineer.

ITEM 751.7 COMPOST BLANKET CUBIC YARD

The work under this Item shall conform to the relevant provisions of Subsection 751 and M1.06.0 Compost of the Standard Specifications and the following:

Work shall consist of furnishing and pneumatically applying compost as a thin mulch blanket (1/2- 1 inch depth) over prepared soil to provide temporary soil stabilization and organic matter for plant growth.

SUBMITTALS AND MATERIALS

No materials shall be delivered until the required submittals have been approved by the Engineer. Delivered materials shall match the approved samples. Approval of test results does not constitute final acceptance.

Contractor shall submit to the Engineer samples and certified test results no sooner than 60 days prior to application of compost. Vender certification that material delivered meets the test results shall be submitted if requested.

Compost shall meet the requirements for M1.06.0: Compost, Type 2, as referenced in the MassDOT– Highway Division Standard Specifications for Highways and Bridges, Division III: Materials Specifications, latest edition.

The Engineer shall approve the Contractor's equipment for application.

CONSTRUCTION METHODS

Application of compost material shall not begin until the Engineer has approved the site and soil conditions. Soil preparation shall be as specified under the applicable item for soil placement or for seeding. The Contractor shall notify the Engineer when areas are ready for inspection and application of compost.

Compost blanket shall be pneumatically applied (blown on) to a minimum depth of one half to one inch. Where shown on the plans or when directed by the Engineer depth may be increased to provide berms for sediment control or to otherwise prevent slope erosion.

When compost blanket is proposed with seeding, seed shall be broadcast and shall occur in conjunction with compost blanket, as specified under the relevant item for seeding.

When compost blanket is proposed for areas with planting, compost (and seed if applicable) shall be applied after planting. If compost and seed occur prior to planting, areas shall be regraded and compost and seed reapplied to the satisfaction of the Engineer and at the Contractor’s expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 751.7 will be measured and paid for at the Contract unit price per Cubic Yard which price shall include all labor, materials, equipment, and all incidental costs required to complete the work of pneumatically applying compost.

ITEM 751.7 (Continued)

Surface preparation of substrate receiving compost blanket shall be compensated under the applicable item for placement of loam, sand, ordinary borrow, wetland soil, topsoil rehandled and spread, tilled existing soil, or other specified substrate.

Seeding, if utilized, will be compensated for under the appropriate seeding items.

ITEM 756. NPDES STORM WATER POLLUTION PREVENTION PLAN LUMP SUM

This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (CGP) issued by the U.S. Environmental Protection Agency (EPA).

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the EPA for coverage under the NPDES General Permit for Storm Water Discharges from Construction Activities. The Contractor shall be fully responsible for compliance with the most recently issued CGP and any subsequent revisions. Should a fine or damages be assessed against it, or MassDOT, as a result of a local, state, or federal enforcement action due to non-compliance with the CGP, the Contractor shall take full responsibility.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a fourteen (14) day review period commencing from the date on which EPA enters the Notice into their database. Based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (SWPPP) for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the afore-mentioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. The contractor shall prepare the SWPPP and update it as necessary. The Contractor shall submit the Plan to the Engineer for approval at least four (4) weeks prior to any site activities. It is the responsibility of the Contractor to comply with the CGP conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to the project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits.

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA CGP, provide all information required, and obtain any and all certifications as required by the CGP. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, regulations, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

ITEM 756. (Continued)

In addition to the CGP requirements for inspections, MassDOT requires inspection of all erosion controls and site conditions on a weekly basis. Inspections are also required at portions of sites that discharge to sediment or nutrient impaired or high quality waters per the CGP when each incidence of rainfall exceeding 0.25 inches in twenty-four hours or after snowmelt discharge from a storm event that produces 3.25 inches or more of snow within twenty-four hours occurs. The CGP requires that inspections be performed by a qualified individual as outlined in the CGP. MassDOT requires proof of completion of a 4 hour minimum sedimentation and erosion control training class current to the latest CGP. This individual can be, but not limited to, someone that is either a certified inspector, certified professional, or certified storm water inspector. The documentation shall be included as an appendix in the SWPPP. The inspector's qualifications shall be submitted to the Engineer for approval prior to beginning any work. This individual shall be on-site during construction to perform these inspections. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the CGP. The Standard Specifications require adequate erosion control for the duration of the Contract. All control measures must be properly selected, installed, and maintained in accordance with manufacturer specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Contractor to replace or modify the control for site conditions at no additional cost to the Department. Contractor must maintain all control measures and other protective measures in effective operating conditions and shall consider replacement of erosion controls for each construction season.

The work under this item shall also include the preparation, submission and implementation of a Flood Contingency Plan. The plan shall address the potential need for the temporary relocation of construction and auxiliary equipment situated within the 1% annual chance of flooding zone to designated upland locations above the Base Flood Elevation during flood events. The Flood Contingency Plan shall address any additional MassDEP-required information requirements, as applicable. The Flood Contingency Plan shall be submitted to the Engineer for review and approval at the same time as the SWPPP.

This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, preparation of monthly reports and Flood Contingency Plan. In addition, any erosion controls beyond those specified in bid items which are selected by the

ITEM 756. (Continued)

Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

The CGP provides specific requirements for temporary and final stabilization. This shall be incorporated into the project schedule. The permit defines specific deadline requirements for Initial Stabilization ("immediately", i.e., no later than the end of the next work day following the day when earth-disturbing activities have temporarily or permanently ceased) and for Complete Stabilization Activities (no later than 14 calendar days after the initiation of stabilization). Stabilization criteria for vegetative and non-vegetative measures are provided in the CGP.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved, as well as removal and proper disposal of all construction materials, waste and waste handling devices, removal of all equipment and construction vehicles, removal of all temporary stormwater controls, etc. Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer's Final Estimate. The permittee shall use EPA's website to prepare and submit the NOT.

BASIS OF PAYMENT

Item 756 will be paid for at the Contract unit price Lump Sum, which price shall include all labor, materials, equipment, SWPPP & Flood Contingency Plan preparation, revisions/addenda during construction, monthly reports, filing fees, and all incidental costs required to complete the work.

Payment of 50% of the Lump Sum price of this item will be made upon acceptance of the NPDES Stormwater Pollution Prevention Plan & Flood Contingency Plan.

Payment of 40% of the Lump Sum price of this item will be will be paid in equal monthly installments distributed across the time remaining in the accepted baseline schedule until substantial completion.

The remaining 10% of the Lump Sum price of this Item will be paid following accepted submission of a Notice of Termination (NOT) when final stabilization has been achieved.

ITEM 765.21 ANNUAL COVER CROP FOR NATIVE SEEDING POUND

Work under this item shall conform to the relevant provisions of Subsection 765 of the Standard Specifications and the following.

DESCRIPTION

Work consists of furnishing and applying the appropriate annual grass to be seeded as a cover crop in conjunction with upland native seeding and at the rate specified herein.

A cover crop shall be used for following conditions:

- when specified under Application Rate for the permanent native upland seed mix
- for slopes 2:1 or steeper and an annual is not already specified as part of the permanent mix
- when seeding out of season and the native seed mix does not already specify an annual
- as required to prevent erosion until the permanent seed establishes.

A cover crop is not necessary for wetland seeding and is not typically necessary for soil stabilization when seeding in conjunction with a compost blanket application.

Annual rye (*Lolium multiflorum*) will not be accepted as an annual cover crop.

Using annual rye or exceeding the application rate such that a dense stand of annual grasses prevents germination of the native grasses will require mowing of annual grasses. In this instance, mowing of cover crop will be incidental to this item.

Seed and Application Rate

Add 30 pounds/acre of the following seed based on seeding season:

Avena sativa (Grain Oats):	1 January to 31 July
Cecale cereale (Grain Rye):	1 August to 31 December

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Annual Cover Crop will be measured for payment per pound of seed per pound of seed, complete in place.

Annual Cover Crop will be paid at the contract unit price per pound upon approval of seed bag tags or other documentation of correct application rate and species, and upon acceptance of a satisfactory stand of annual grasses three weeks following seeding.

Application and care of cover crop will be paid for separately under Item 735.635 Native Seeding and Establishment.

ITEM 765.554 WETLAND MIX – SEASONALLY FLOODED POUND

Work under this item shall conform to the relevant provisions of Subsection 765 of the Standard Specifications and the following:

Work under this item shall consist of furnishing the mix(es) specified below in the required quantity.

SUBMITTALS

1) Pre-Verification of Seed Availability. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species in the required quantities and for the anticipated date of seeding. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. Species not expected to be available should be noted and substitutions recommended.

2) Final Verification of Seed Availability. No earlier than 21 days prior to ordering, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species and in the required quantities. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section. Substitutions or changes in the mix at this time must be approved by MassDOT Landscape Design Section.

3) Seed Worksheet provided herein shall be submitted to the Engineer prior to ordering seed to determine the number of pounds of Pure Live Seed required.

4) Seed Tags. The contractor shall submit original seed tags from each bag of seed used on the project or ensure that each tag is photo documented by the Engineer while on the unopened bag.

   Number of tags submitted must correspond to number of bags delivered.

   Species listed on the seed tag shall match the Final Verification of Seed Availability (Submittal #2) unless approved otherwise. Tag must include: variety and species name; lot number; purity; percentage of inert matter; percentage of weeds, noxious seeds, and other crop seeds; germination, dormant or hard seed; total viability; origin of seed; germination test date, net weight, and name and address of seller. The origin of seed must be listed on the seed tag for all species in the mix to provide verification of original (generation 0) seed source. The smallest known geographic area (township, county, ecotype region, etc.) shall be listed. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

   A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

ITEM 765.554 (Continued)

5) Verification of Seed Delivery. Prior to payment, contractor shall submit the Seed Delivery Verification form contained within the contract or the Supplier's Verification on company letterhead or a bill of lading. Supplier verification must include all information requested on the Verification form within this contract. The bill of lading must include variety and species name, lot number, net weight shipped, date of sale, invoice, project or seeding location, and name and address of Supplier. All information must be filled in and complete for acceptance. Information must match the seed tags and quantity of seed used on the job. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section

6) Seed Sample. If requested or if seed is from a previously opened bag, the contractor may be asked to submit to the Engineer a sample of seed from the seed bag (1-2 cups) at the time of seeding.

SEEDING SEASON

The appropriate seeding seasons are:

Spring: April 1 - May 15
Fall: October 1 - December 1 for dormant seeding

PERMANENT SEED MIX(ES)

Calculating Pure Live Seed (PLS)

Quantities specified are PURE LIVE SEED. Greater quantities of ordered seed may be required to achieve actual specified seeding rates.

Pure Live Seed (PLS) is defined as a percentage calculated by multiplying the percent of pure seed by the percent of viable seed (total germination, hard seed, and dormant seed). For example:

If a seed label indicates 90% purity, 78% germination, 10% hard seed, and 2% dormancy, it is calculated to be 90% x [78 + 10 + 2]% = 81% PLS.

Therefore, each pound of PLS would need 1 pound / 0.81 = 1.2 pounds of seed with a 90% purity and 90% total germination

Seed Mix(es) shall be as specified below. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

ITEM 765.554 (Continued)

Mix 765.544 Wetland Mix – Seasonally Flooded consists of both upland and wetland species and includes species that tolerate wet (~30%) to mesic conditions and provides pollinator habitat. Mix shall be applied to wetland and upland areas adjacent to or within infiltration basins.

Item 765.554 Wetland Mix – Seasonally Flooded

	Botanical Name	Common Name	% PLS By Weight
Grass			
	Elymus riparius	Riverbank Wild Rye	20.00%
	Andropogon gerardii NY Eco	Big Bluestem NY Eco	12.00%
	Carex lupulina	Hop Sedge	10.00%
	Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	10.00%
	Carex vulpinoidea	Fox Sedge	10.00%
	Carex scoparia	Broom sedge	8.00%
	Sorghastrum nutans NY Eco	Indiangrass NY Ecotype	8.00%
	Panicum virgatum	Switch Grass	8.00%
	Juncus effusus	Soft Rush	2.00%
	Juncus tenuis	Path Rush	1.00%
			89.00%
Herb/Forb			
	Verbena hastata	Blue Vervain	4.00%
	Desmodium canadense	Showy Tick Trefoil	2.00%
	Eupatorium maculatum	Joe-pye Weed	1.00%
	Asclepias incarnata	Swamp Milkweed	1.00%
	Aster novae-angliae	New England Aster	1.00%
	Eupatorium perfoliatum	Boneset	0.70%
	Helenium autumnale	Common Sneezeweed	0.50%
	Aster puniceus	Aster - Swamp	0.50%
	Mimulus ringens	Monkey Flower	0.20%
	Vernonia noveboracensis	New York Ironweed	0.10%
			11.00%
			100.00%

ITEM 765.554 (Continued)

Application Rate

Wetland Mix – Seasonally Flooded: 20.0 lbs/acre PLS. In addition, apply 30 pounds of cover crop (grain oats or grain rye) as appropriate to the season and as specified under Item 765.21.

Any species substitutions shall be with a species having similar characteristics and function. Substitutions must be approved by MassDOT Landscape Design Section per the documentation submittal process.

50% Increase Adjustment for Field Conditions

Seeding under the following conditions requires a 50% increase in the permanent mix at the time of construction:

- Seeding out of season
  OR
- Seeding after Compost Blanket has been applied (unless already increased for out of season).

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 765.554 Wetland Mix – Seasonally Flooded will be measured for payment by the POUND after one full growing season (June-September) has elapsed between seed application and inspection and upon approval of establishment by the Engineer and the MassDOT Landscape Architect. The item will be paid for at the Contract unit price per POUND upon receipt of required submittals as specified above and upon approval of established stand of grass as specified above. Application of native seed mix will be paid for separately under Item 735.635 Native Seeding and Establishment.

ITEM 765.554 (Continued)

SUPPLIER VERIFICATION OF SEED DELIVERY FOR MASSDOT PROJECTS

Date_____

We hereby certify that (*Seed Supplier*):_____

Furnished to (*Contractor*): _____

For use on: (*Project Description*) _____

Project #: _____ Contract #: _____

Pounds of Pure Live Seed: _____

Of Mix (*Description*): _____

Lot Number _____

The material was delivered on (*Date*)_____.

The labels and contents meet all State and Federal regulations. The mixture consists of the following species, including cultivars (as applicable) and ecotype region, and at the following percentages (may be attached separately):

Name (print): _____ Title: _____

Supplier: _____

Signature and Seal: _____

ITEM 765.635 NATIVE SEEDING AND ESTABLISHMENT SQUARE YARD

This special provision has been modified for Project #608491 – Mendon Route 16 Reconstruction.

Work shall conform to the relevant provisions of Subsections 765 and 767 of the Standard Specifications and the following:

The work under this item shall consist of seeding, mowing, and other care to establish a stand of grass in the areas shown on the plans, as required by the Engineer in coordination with the MassDOT Landscape Architect, and as required by the Order of Conditions. For the purposes of these specifications, the term "grass" shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

QUALIFICATIONS

Seeding shall be done by a company having a minimum of five years of experience with native seed establishment. Within three months of the Notice to Proceed, the Contractor shall furnish proof of qualifications to the Engineer and the MassDOT Landscape Architect for approval. Proof of qualifications shall include providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and establishment and proof of having completed successful native seeding projects.

SEEDING SEASON

Seeding seasons for native mixes is April 1 - May 15 and October 1 - December 1 for dormant seeding. Written approval must be obtained for seeding outside the seeding season and, if approved, the permanent seed rate shall be increased by 50%.

Seeding season for cover crops shall be grain oats January 1 – July 31 and grain rye August 1 – December 1.

MATERIAL AND SUBMITTALS

Seed Mixes and Submittals shall be per the item(s) for permanent and annual (cover crop) seed mixes.

Compost Blanket, if used, shall meet the material and submittal requirements for that item.

Hydromulch shall be wood fiber or straw applied per the Standard Specifications and at the rates specified below and per the manufacturer.

A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of hydromulch, tackifier, and seed, per 100 gallons of water and as applicable to products used. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above.

ITEM 765.635 (CONTINUED)

Fertilizer

No fertilizers shall be applied.

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

SEEDING

Hand broadcast method shall be used for all areas smaller than half an acre and when specified on the plans for areas over half an acre.

Seeding shall occur within 72 hours of placement of loam and final grading or the Contractor shall propose a reasonable, alternative schedule that shall be approved by the Engineer.

Surface Preparation

No seeding or soil preparation shall be done if soils are muddy or dry and compacted. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Ruts and depressions shall be filled with additional loam or compost and the soil shall be re-graded to a relatively smooth finish corresponding to the required grades.

When seeding over existing or compacted soil or soil that has sat bare for more than 30 days, surface will be prepared by tilling or raking to a minimum depth of 2 inches prior to seeding and prior to Compost Blanket application (when applied).

Surface preparation shall be compensated for under for loam placement or topsoil rehandled and spread as appropriate to the project.

Jute or coir mesh, when specified in the contract, shall be placed after seeding and per the Standard Specifications and the manufacturer’s instruction.

Surface preparation shall be approved by the Engineer prior to seeding.

Seeding over Various Substrates

Loam: Seeding shall occur within 72 hours of loam placement to prevent loss of topsoil. Seed shall be manually broadcast for areas less than half an acre (each area, not cumulative area) and when specified on the plans. Broadcasting shall be immediately followed by hydromulching as specified below. When not specified on the plans, larger areas may be hydroseeded as specified below.

ITEM 765.635 (CONTINUED)

Compost Blanket: Compost Blanket shall be applied as specified under that item. Seed should be hand broadcast at the same time as compost application to ensure a thin cover of compost over seed.

When seeding is done after application of Compost Blanket the rate shall be increased by 50%. If the Compost Blanket is applied after December 1, seed shall be broadcast or hydroseeding over the compost in the Spring and the rate increased by 50% specified under Seed Application.

Compost Mulch over Modified Rock: Compost Mulch and seed shall be applied as specified under that item. No hydromulch is required.

Cover Crop

Cover crop shall be used when seeding out of season, when specified with the permanent native seed mix under that item, and as required to prevent erosion until the permanent seed establishes. A cover crop should not be used with a steep slope mix or other permanent mix which already contains either cereal rye or oats in the composition of the mix. A cover crop is not necessary for wetland seeding and is not typically necessary for soil stabilization when seeding in conjunction with a compost blanket application.

Seed Application

All seed shall be mulched as specified herein.

Seed application shall be by broadcast seeding or by hydroseeding as described below.

Broadcast Seeding

Seed shall be broadcast spread using a cyclone or whirlwind seeder or hand broadcast. Small or light-seeded species such as bluestem may be mixed with approved filler to achieve an even distribution. Seed shall not be broadcast when wind velocities are greater than 15 mph.

Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction (horizontally and vertically). To ensure seed to soil contact with broadcasting of seed, seeding shall be followed by rolling or tracking with equipment approved by the Engineer.

Broadcast seed shall be mulched with weed-free straw mulch unless seeding is done as part of Compost Blanket in which case it shall be as specified above under seeding with Compost Blanket application. Hydromulching shall be as specified under Hydromulching.

Hydroseeding and Hydromulching

ITEM 765.635 (CONTINUED)

Hydroseed and mulching shall be per the manufacturer's directions and as follows.

Hydroseeding shall only be used for sites over half an acre in size or with permission of the Engineer.

Tank and hoses shall be cleaned from all previous hydroseeding and hydromulching projects. Seed shall be mixed into the slurry immediately before application and slurry applied within 30 minutes after seeds have been placed in the tank. Once seed has been placed in the tank, tank shall be agitated only enough to mix the seeds and keep slurry from separating.

A 2-step process shall be used for seeding in conjunction with hydromulch. Seed shall be applied with 500 lbs/acre of hydromulch in the first pass. A second pass with 1,000 lbs/ acre of hydromulch shall be applied in a second pass. Each pass shall be applied in a different direction.

Once the seed has been added to the tank mixture a one-hour time limit is set for spreading the mixture on the soil. Once the one hour has passed the excess mixture must be discarded.

For broadcast seeding, hydromulch shall be applied immediately following seeding at a rate of 1,000 lbs/acre. Tank shall be cleaned from any previous hydroseeding.

CARE DURING GERMINATION AND ESTABLISHMENT

Contractor shall care for seeded areas as necessary for successful germination. Care will include watering and weed control as necessary to achieve establishment of the specified seeded species after one growing season as specified below.

The contractor shall maintain the stand of grasses to ensure healthy growth of the seeded species. Work shall include mowing or weed-whacking for weed control, watering if necessary, and removal of invasive plants.

Watering shall be sufficient to achieve soil moisture to a depth of 2 inches or more and such moisture is uniform. Method of watering shall not erode or damage soil or grassed surfaces.

General Weed Control: Unless otherwise directed, mowing shall be as specified under Mowing for Weed Control for seed establishment. Weeds shall be mowed prior to weeds setting seed (by the end of July unless otherwise approved).

Control of Invasive and Aggressive Weeds: Invasive and aggressive weeds, including but not limited to mugwort, ragweed, knapweed, foxtail, crabgrass, and chicory must be cut or treated prior to going to seed. Herbicide treatment must be coordinated with MassDOT. Undesired species (such as chicory) introduced due to use of incorrect seed mix shall be removed at the Contractor's expense.

ITEM 765.635 (CONTINUED)

MOWING FOR WEED CONTROL

Mowing for weed control shall be completed after weeds have sprouted and show leaf and bud growth, but prior to setting seed, generally between July 7th and August 1st, unless directed otherwise by the MassDOT Landscape Architect and the Engineer.

Mowing height shall be as needed for weed control, generally to a height of 8 inches and not below 4 inches, unless directed otherwise. Mowing shall be with a brush hog mower or string trimmer other approved equipment. Conventional lawn mowers which cannot achieve the appropriate cut shall not be used.

Contractor shall give 48-hour notice prior to mowing work. Mowing shall only occur in dry sunny weather. Litter pickup should occur prior to mowing in all areas. If required, cut grass shall be raked and removed. Litter pickup and raking and removal of grass shall be incidental to the work.

Mowing equipment shall be approved by the Engineer prior to work.

OVER-SEEDING

Areas of bare ground greater than 2-3 feet in diameter shall be over-seeded with the specified mix during the appropriate season for seeding. Where required for overseeding mowing shall be as close to the soil as possible. Soil that is compacted shall be raked or otherwise roughened prior to over-seeding.

Over-seeding rates and methods shall those specified above under Materials and Methods. Following over-seeding, soil shall be lightly tamped to ensure seed to soil contact and areas shall be mulched with straw mulch and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Over-seeding, mulch, watering, and all work for over-seeding shall be incidental.

DETERMINING SATISFACTORY GRASS ESTABLISHMENT

- A well-established stand of the specified seeded species as determined by the Engineer and the MassDOT Landscape Architect and as meets the Order of Conditions will be required for Final Acceptance. The expectation is that an acceptable number and variety of the desired permanent seeded species (not the cover crop) will be visible. Generally:
- A minimum of 75% coverage by the specified permanent seeded species after one growing season. Of that percentage, generally, depending on the mix species:
    - At least 3 types of the permanent seeded grass species shall be visible.
    - At least 3 species of wildflowers shall be visible.
- There will be no significant gaps or bare soil (generally 2-3 feet in diameter or greater).
- There will be no more than 25% coverage by weed species.

ITEM 765.635 (CONTINUED)

- All soil shall be stabilized and there shall be no channeling or erosion.
- There will be no invasive or aggressive species within the stand at the time of acceptance.
- There shall be no evidence of seed from non-native mixes (i.e., clover) due to failure to clean the hydroseeding tank or using incorrect mix.

Invasive and aggressive weeds (such as mugwort, ragweed, knapweed, and chicory) must be cut or treated prior to going to seed for Interim Acceptance. Herbicide treatment must be coordinated with MassDOT.

A warm-season grass mix with perennials will not have uniform growth. A uniform stand of grass may indicate use of an incorrect mix.

ACCEPTANCE OF SEEDING AND ESTABLISHMENT WORK

Conditional Acceptance shall be based on proper application of seed as specified herein.

Interim Acceptance of Care. Seeding will be inspected by the Engineer and the Landscape Architect in mid-July to assess germination and Establishment conditions as described above. When necessary for Interim Acceptance, areas shall be mowed prior to weed species producing seed and as specified above under Weed Control. ***Areas requiring weed control that are not mowed prior to weed seed dispersal will not be approved for Interim Acceptance.*** Seeding that shows good germination and is determined by the Engineer and Landscape Architect to not require weed control at time of inspection shall be accepted for Interim Acceptance payment.

Final Acceptance of Establishment shall be given by the Engineer and Landscape Architect upon satisfactory Establishment as described above.

If the seeded area fails to meet the requirements of Establishment by the end of the growing season, contractor shall propose and implement remediations and site shall be inspected during the following growing season after July 1st. All remediation shall be at the contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Native Seeding and Establishment will be measured for payment by the square yard, complete in place.

Native Seeding and Establishment will be paid at the Contract unit price by the square yard upon Conditional, Interim, and Final Acceptances as described above. This price shall include all submittals, seeding, rolling to ensure seed-to-soil contact, weed control other than mowing, water, over-seeding, labor, materials, equipment, and all incidental costs required to complete the work of establishing a satisfactory stand of grass.

Native seed and cover crop mixes shall be compensated under the respective items.

Site preparation, including raking, tilling, removal of debris and stones, and other work to the

ITEM 765.635 (CONTINUED)

prepare site for seeding shall be compensated under loam placement or topsoil rehandled and spread as relevant to the project. If used, Compost Blanket shall be compensated under the respective item.

Option 1: Mowing for weed control will be paid as specified under Item 765.664.

Schedule of payment shall be as follows:

20% upon Conditional Acceptance

20% upon Interim Acceptance of Care, except this amount will be reduced to zero and final payment will be reduced accordingly when areas requiring weed control are not mowed as specified in the Interim Acceptance criteria.

60% upon Final Acceptance of Establishment

ITEM 767.121 SEDIMENT CONTROL BARRIER FOOT

The work under this item shall conform to the relevant provisions of Subsections 670, 751 and 767 of the Standard Specifications and shall include the furnishing and placement of a sediment control barrier. Sediment control barrier shall be installed prior to disturbing upslope soil.

The purpose of the sediment control barrier is to slow runoff velocity and filter suspended sediments from storm water flow. Sediment barrier may be used to contain stockpile sediments, to break slope length, and to slow or prevent upgradient water or water off road surfaces from flowing into a work zone. Contractor shall be responsible for ensuring that barriers fulfill the intent of adequately controlling siltation and runoff.

Twelve-inch diameter (after installation) compost filter tubes with biodegradable natural fabric (i.e., cotton, jute, burlap) are intended to be the primary sedimentation control barrier.

For small areas of disturbance with minimal slope and slope length, the Engineer may approve the following sediment control methods:

- 9-inch compost filter tubes
- Straw bales which shall be trenched

No straw wattles may be used. Additional compost filter tubes (adding depth or height) shall be used at specific locations of concentrated flow such as at gully points, steep slopes, or identified failure points in the sediment capture line.

When required by permits, additional sediment barrier shall be stored on-site for emergency use and replacement for the duration of the contract.

Where shown on the plans or when required by permits, silt fence shall be used in addition to compost filter tubes and straw bales and shall be incidental to the item.

Sediment control barriers shall be installed in the approximate location as shown on the plans and as required so that no excavated or disturbed soil can enter mitigation areas or adjacent wetlands or waterways. Barriers shall be in place prior to excavation work. No work shall take place outside the barriers.

MATERIALS AND CONSTRUCTION

Prior to initial placement of barriers, the Contractor and the Engineer shall review locations specified on the plans and adjust placement to ensure that the placement will provide maximum effectiveness.

Barriers shall be staked, trenched, and/or wedged as specified herein and according to the Manufacturer's instructions. Barriers shall be securely in contact with existing soil such that there is no flow beneath the barrier.

ITEM 767.121 (CONTINUED)

Compost Filter Tube

Compost material inside the filter tube shall meet M1.06.0, except for the following: no peat, manure or bio-solids shall be used; no kiln-dried wood or construction debris shall be allowed; material shall pass through a 2-inch sieve; and the C:N ratio shall be disregarded.

Outer tube fabric shall be made of 100% biodegradable materials (i.e., cotton, hemp or jute) and shall have a knitted mesh with openings that allow for sufficient water flow and effective sediment capture.

Tubes shall be tamped, but not trenched, to ensure good contact with soil. When reinforcement is necessary, tubes shall be stacked as shown on the detail plans.

Straw Bales

Straw bales shall be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

Bales should be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. All bales should be either wire-bound or string-tied. Straw bales should be installed so that bindings are oriented around the sides (rather than along the tops and bottoms) of the bales in order to prevent deterioration of the bindings.

The barrier should be entrenched and backfilled. A trench should be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. The trench must be deep enough to remove all grass and other material which might allow underflow. After the bales are staked and chinked (filled by wedging), the excavated soil should be backfilled against the barrier. Backfill soil should conform to the ground level on the downhill side and should be built up to 4 inches against the uphill side of the barrier.

Each bale should be securely anchored by at least 2 stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together. Stakes or re-bars should be driven deep enough into the ground to securely anchor the bales. For safety reasons, stakes should not extend above the bales but should be driven in flush with the top of the bale.

The gaps between the bales should be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency. Wedging must be done carefully in order not to separate the bales.

When used in a swale, the barrier should be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden

ITEM 767.121 (CONTINUED)

runoff will flow either through or over the barrier but not around it.

Sedimentation Fence

Materials and Installation shall be per Section 670.40 and 670.60 of the Standard Specifications and the following:

Silt fence shall only be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

When used with compost filter tubes, the tube shall be placed on a minimum of 8 inches of folded fabric on the upslope side of the fence. Fabric does not need to be trenched.

When used with straw bales, an 8-inch deep and 4-inch wide trench or V-trench shall be dug on the upslope side of the fence line. One foot of fabric shall be placed in the bottom of the trench followed by backfilling with compacted earth or gravel. Stakes shall be on the down slope side of the trench and shall be spaced such that the fence remains vertical and effective.

Width of fabric shall be sufficient to provide a 36-inch high barrier after fabric is folded or trenched. Sagging fabric will require additional staking or other anchoring.

MAINTENANCE

Maintenance of the sediment control barrier shall be per Section 670.60 of the Standard Specifications or per the Stormwater Pollution Prevention Plan (SWPPP), whichever is more restrictive.

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract.

Barriers that decompose such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact and continues to provide effective water and sediment control, barrier does not necessarily require replacement.

DISMANTLING & REMOVING

Barriers shall be dismantled and/or removed, as required, when construction work is complete and upslope areas have been permanently stabilized and after receiving permission to do so from the Engineer.

Regardless of site context, nonbiodegradable material and components of the sediment barriers, including photo-biodegradable fabric, plastic netting, nylon twine, and silt fence, shall be removed and disposed off-site by the Contractor.

ITEM 767.121 (CONTINUED)

For naturalized areas, biodegradable, natural fabric and material may be left in place to decompose on-site. In urban, residential, or other locations where aesthetics is a concern, the following shall apply:

- Compost filter tube fabric shall be cut and removed, and compost shall be raked to blend evenly (as would be done with a soil amendment or mulch). No more than a 2-inch depth shall be left on soil substrate.
- Straw bales shall be removed and disposed off-site by the Contractor. Areas of trenching shall be raked smooth and disturbed soils stabilized with a seed mix matching adjacent seeding or existing grasses (i.e., lawn or native grass mix).
- Silt fence, stakes, and other debris shall be removed and disposed off-site. Site shall be restored to a neat and clean condition.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.121 will be measured and paid for at the contract unit price per foot of sediment control barrier which price shall include all labor, equipment, materials, maintenance, dismantling, removal, restoration of soil, and all incidental costs required to complete the work.

Silt fence, when used in conjunction with compost filter tubes or straw bales, will be incidental to this item.

Additional barrier, such as double or triple stacking of compost filter tubes, will be paid for per foot of tube installed.

Barriers that have been driven over or otherwise damaged by construction activities shall be repaired or replaced as directed by the Engineer at the Contractors expense.

ITEM 777.538	**PLANETREE – LONDON 8 - 10 FT/#15**	**EACH**
ITEM 782.533	**REDBUD – EASTERN 4-5 FEET**	**EACH**

The work under these items shall conform to the applicable requirements of Section 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the latest edition of the Standard Specifications.

Two trees shall be located between Station 240+50-241+00L and shall be field located by the Engineer and the MassDOT Landscape Architect in coordination with the abutter. Tree species shall be determined in the field with the abutter. Trees not used in this location may be used elsewhere on the project per the MassDOT Landscape Architect.

Trees shall be placed equidistant from the steps (similar to existing trees to be removed). Trees shall be a minimum of 8 feet from sidewalk and not planted on the slope and sufficiently far from steps that branches do not interfere with passage when trees reach a mature size.

PLANTING

As shown in the Details, soil shall be carefully removed to expose the root flare of all B&B and container plants. Plants shall be watered prior to backfilling of planting pits and again after backfilling.

Plants planted incorrectly (too deep, girdled roots, root balls not scored) shall be deemed unacceptable for payment. The problem shall be remediated, and the plants re-planted to the satisfaction of the Landscape Architect. Plants with root systems that cannot be untangled or that require such severe pruning that the plant is compromised shall be rejected on site and replaced at the contractor's expense.

WATERING

The Engineer shall be notified prior to watering. Watering shall meet the requirements for the MassDOT Standard Specifications. In addition, a Watering Log for MassDOT Plantings document A00811 shall be submitted to the Engineer at the end of each week or as requested by the Engineer. Watering and submitting of the weekly Watering Log shall commence immediately following planting and shall continue until the end of the plant warranty.

Failure to submit the watering log and/or notify the Engineer will result in deductions or non-payment for plants at the Interim and Final Acceptance inspections. This may include rejection of plants that have healthy foliage at the time of inspection but have been compromised (root system loss) due to lack of water during establishment.

MEASUREMENT AND BASIS OF PAYMENT

Items 775.538 and 782.533 will be measured for payment by each tree planted.
Items 775.538 and 782.533 will be paid at the contract unit price per each tree planted and acceptance as described above.

ITEM 813.811 ELECTRIC SERVICE RISER RELOCATION EACH

The work shall conform to the relevant provisions of Section 813 of the Standard Specifications and the following:

CONSTRUCTION METHODS

The work under this item shall consist of the removal and relocation of electric service risers attached to utility poles supplying secondary and or primary electrical service through underground conduit. The existing underground utility services are as necessary from relocated utility poles located within project limits. The existing underground conduit and risers from utility poles service privately owned properties within project limits.

The Contractor shall notify the respective utility company immediately following the Notice to Proceed from MassDOT to generate a Work Order for each Electric Service Riser requiring relocation. These private service relocations need to be properly coordinated with the utility to ensure that they are relocated in conjunction with their overhead relocations and to ensure that they do not delay the other utilities from relocating according to the project schedule.

The existing underground conduit shall be excavated and exposed for a necessary distance to allow for the re-alignment of the conduit to the relocated pole as determined by the local utility company servicing the property. The existing galvanized riser and sweep at the base of pole shall be removed and become the property of the Contractor to dispose of in accordance with all applicable regulations. This service shall include the first 10’ of the riser on the described utility pole, the sweep, a coil of wire acceptable to the local utility company and all other materials required for the relocation including any additional conduit.

The work shall include all excavation and backfill, compaction, new riser, new conduit, new wire and materials, concrete encasement or any other requirements in accordance with the latest edition of the National Electrical Code, the respective utility company, local codes and guidelines.

The work associated with disconnecting power and reconnecting power to the utilities secondary and primary power lines is the responsibility of the Contractor to coordinate with the local utility company and shall be performed at a time convenient to the property owners or tenants occupying the building. The actual time of day or evening for the disconnecting and reconnecting will be agreed upon between the Engineer, the local power company servicing this location and the property owner/tenant during construction. A representative from the Contractor shall be present when this work is performed. No additional compensation shall be given for this work outside of normal work hours if necessary.

The work associated with the removal of utility poles and the transfer of the Utilities overhead primary and secondary wiring shall be the responsibility of the respective utility companies and shall not be paid for under this item.

ITEM 813.811 (Continued)

METHOD OF MEASUREMENT

Item 813.811 Electric service riser relocation shall be measured per each, Electric service riser relocated, complete in place.

BASIS OF PAYMENT

Item 813.811 Electric service riser relocation shall be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment, and incidental costs required to complete the work. All costs and or fees required by the respective utility provider to perform work associated with this service are also included.

ITEM 815.1	**TRAFFIC CONTROL SIGNAL LOCATION 1**	**LUMP SUM**
ITEM 815.2	**TRAFFIC CONTROL SIGNAL LOCATION 2**	**LUMP SUM**
ITEM 816.03	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION 3**	**LUMP SUM**

Work under these items shall conform to the relevant provisions of Section 800 of the Standard Specifications, the 2009 Manual on Uniform Traffic Control Devices (MUTCD), Subsection M4.02.14 Precast Concrete Highway Units of Section 201 (M4.02.14 Precast Concrete Highway Units is included in the appendix and shall replace M4.02.14 Precast Units of the Standard Specifications) and the following:

The above Items refer to work during construction and final restoration. The work shall include furnishing and installing part or all of the following items:

- Traffic signal controller, backpanel, Malfunction Management Unit, Bus Interface Unit, load packs, relay flashers, loop amplifiers, grounding rod, police panel, and all wiring and appurtenances to complete the installation;
- Signal posts and foundations and mast arm foundations with anchor bolts;
- Signal heads, backplates, and tunnel visors;
- Pedestrian signals with countdown timers;
- Audible pedestrian pushbuttons, signs and saddles;
- Wire loop detectors;
- Equipment grounding and bonding;
- Emergency vehicle pre-emption system;
- All cable and wiring;
- All other equipment, materials and incidental costs necessary to provide a complete, fully operational traffic signal system as specified herein and as shown on the plans.

The work under this item shall also include project restoration. The locations correspond to the following intersection:

- Location 1 – Route 16 at Hartford Avenue
- Location 2 – Route 16 at Maple Street
- Location 3 – Route 16 at North Avenue/Main Street

A list of major traffic signal items required at these intersections are included on the plans.

ITEM 815.1, 815.2 and 816.03 (Continued)

SHOP DRAWINGS

Within 30 days following the date of the Notice to Proceed, the Contractor shall submit shop drawings for signal supports, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Section 815.20.

No work shall be commenced by the Contractor until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer. Approval of these drawings will be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans and specifications.

The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer.

EXISTING TRAFFIC SIGNAL EQUIPMENT REMOVED AND STACKED (ITEM 816.03)

All existing traffic signal equipment shall be removed and stacked by the contractor and transported by the contractor to a secure location as directed by the Engineer.

The individual items of work shall include but not necessarily be limited to: removing, transporting and stacking or disposing existing traffic signal equipment including the removal and disposal of their foundations and electrical system; removing and disposing or abandoning existing hand holes and signal conduit. Old cable, all unusable material, existing mast arms/supports and any item rejected by the Engineer for stacking, shall be disposed of legally by the Contractor.

The work shall also include the excavation and backfilling with compacted gravel of the holes resulting from the excavation of the foundations and the replacement, in kind, of any surface material disturbed.

TRAFFIC SIGNAL SERVICE CONNECTIONS

Item 816.03 existing power service connections shall be removed and stacked unless otherwise noted.

Any work involving the removal and connection of the power service shall be coordinated with the utility company. All service connection work shall be incidental to the Contract unit price bid.

See Section 813.63 of the Standard Specifications for additional requirements.

ITEM 815.1, 815.2 and 816.03 (Continued)

The existing traffic signal shall be operational for as long as possible before the proposed signal is put into flashing mode. Contractor shall be responsible for providing temporary signals if the intersection is without signal control for an extended period of time.

The Contractor shall coordinate with the servicing utility company for installation of a new service meter to the new controller cabinet.

Service connections shown on the plans are approximate only. The Contractor shall determine exact locations from the servicing utility, arrange to complete the service connections, and be responsible for all charges incidental thereto.

A 100-ampere meter socket approved by the servicing utility company shall be furnished and installed on the side of the control cabinet by the serving utility company.

A 3" PVC Conduit shall be installed from the controller cabinet to the utility pole and/or electric manhole, which will supply electrical service to the controller cabinet. See the plans for conduit trench details.

The Traffic Signal Service Connection detail is provided in the Appendix.

FLASHING OPERATION

Changes from automatic flashing to stop-and-go operation and from stop-and-go to automatic flashing operation shall occur as set forth in the MUTCD.

TRAFFIC SIGNAL EQUIPMENT

Traffic Signal Controller Cabinet

The controller cabinets shall conform to the NEMA TS 2 Type 1 Standards, Section 7. Cabinet size shall be as shown below. It should be noted that approximate cabinet dimensions are in inches. The Cabinet shall be a ground-mounted type and installed on new concrete foundation as shown on the plan.

NEMA TS 2 Cabinet	Cabinet Size (Nominal) (HxWxD*)	Back Panel	Mounting	Malfunction Management Unit
NEMA Size 6	56"x44"x28"	16-Position	Ground	16 Channel

* Approximate cabinet dimensions are provided in inches.

The control cabinet shall be made of aluminum with interior painted aluminum finish, and exterior painted according to the "Painting" section of this special provision.

The control cabinet shall be initially wired with a "D" harness. All wires for this harness shall be properly terminated on the backpanel.

ITEM 815.1, 815.2 and 816.03 (Continued)

The cabinet shall also be wired with a normally closed switch connected to a user defined input to the controller for remote monitoring of the control cabinets' door open status. The controller cabinet shall also be supplied with a Manual Police Button to manually control the operations of the traffic signal via the Police Door Access Panel. Controller cabinet foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired.

The following requirements are applicable to each signalized location and are designed for effective use of a laptop computer in conjunction with traffic signal controllers. These requirements are also designed to permit all engineers, electricians and technicians (including those who are disabled but ambulatory) to work in the cabinet in a safe, effective and comfortable manner. To this extent, the following meets applicable ADA requirements.

1. Furnish and install one slide-out/slide-in shelf or swing-out/swing-in shelf appropriate for the size and load of a laptop computer. This moveable shelf shall support the bottom of the laptop computer at a height between 3'-4" and 3'-8" above finished grade in front of the cabinet.

2. Both the firmware and software version in each timer unit shall be the same throughout the project and shall be the latest version available on the market. In addition, the contractor shall promptly furnish to the owner and install all upgraded versions of both firmware and software through the last day of the inspection period, guarantee period or warranty period, whichever date is later.

3. The contractor shall furnish one cable with each new timer unit to connect a controller timing mechanism to a laptop computer. This cable shall have a termination at one end to match the controller. It shall have a termination on the other end to match the type of serial port found on laptop computers, usually DB9. This cable shall be wired to provide serial RS232C communication between the controller and the computer.

4. Payment for the work described above shall be deemed to be incidental to and included in the prices bid for various items of traffic signal work, and no additional payment shall be made for the work described above.

Advanced Traffic Controller (ATC)
The traffic controllers supplied shall conform to Section 3 "Controller Units" of the NEMA TS 2 Standard. The traffic controllers shall be supplied in a TS 2 Type 1 Configuration as required in the list of major traffic signal items included on the plans. Specifically, the controller units (CU) shall be supplied as an actuated controller with NTCIP capabilities; defined as Type A1N in Subsection 3.2 of the NEMA TS 2 Standard.

The controller units shall utilize an interface conforming to Subsection 3.3 of the NEMA TS 2 Standard. The controller unit shall utilize an input/output interface conforming to the requirements of Paragraph 3.3.1 for all input/output functions with the Terminals and Facilities (TF), Malfunction Management Unit (MMU), detector rack assemblies and auxiliary devices. The controller units shall also meet the requirements of Paragraph 3.3.6 of the NEMA TS 2 Standard.

ITEM 815.1, 815.2 and 816.03 (Continued)

The controller units shall be supplied with Port 1, Port 2, and Port 3 as defined by the requirements of Subsections 3.3.1, 3.3.2, and 3.3.3, respectively. It shall include a temperature compensated, 8 lines by 40 characters display with LED backlight. The controller operating system (OS) shall be Linux and contain a Flash File System to allow for controller software upgrades.

The controller units shall be keyboard-entry menu-driven units with internal time base coordination, emergency preemption, and programmatic capability.

The controllers shall support 1/10th second high-resolution data logging which provides detailed operational information allowing for the generation of enhanced performance metrics. This would include construction of Purdue Coordination Diagrams, time space diagrams and measures of effectiveness.

The controller units shall meet the approval of MassDOT District 3 Office. As part of the shop drawing submission the Contractor shall provide written approval of the controller units from MassDOT.

Malfunction Management Unit (MMU)
The malfunction management units (MMU) shall comply with Section 4 of the NEMA TS 2 standard. The MMU shall be capable of operating as either a Type 16 with 16 channels (8 vehicle, 4 pedestrian and 4 overlap) or a Type 12 with 12 channels (8 vehicle, 4 overlap). The MMU supplied shall be configured to operate as a Type 16 unit.

The MMU in either the Type 16 or Type 12 configuration shall be capable of operating in a NEMA TS 2 Type 1 cabinet, a NEMA TS 2 Type 2 cabinet, or a NEMA TS 1 cabinet without loss of functionality.

Spare Equipment
The Contractor shall provide the following spare signal equipment in each of the traffic signal controller cabinets:

1. A full complement of load switches to accommodate each available position of the back panel.
2. A full complement of flash transfer relays to accommodate each available position of the back panel.
3. A 25-foot RS-232 cable for communication function with a laptop computer.
4. Two (2) BUI (one at each location).

Surge Suppression
The Contractor shall supply and install surge suppression on all outputs and inputs in each of the traffic signal controller cabinets per the manufacturer’s recommendations.

Bus Interface Units
The Bus Interface Units (BIU) shall comply with Section 8 of the NEMA TS 2 Standard. The BIU shall be fully interchangeable with any other manufacturer's unit and interchangeable in a NEMA TS 2 Type 2 cabinet assembly.

ITEM 815.1, 815.2 and 816.03 (Continued)

At a minimum the BIU shall perform the interface function between port 1 at the controller unit, the malfunction management unit (MMU), the loop detector rack assembly, and the terminal facilities. The cabinets shall be supplied with the appropriate number of BIUs required to provide an operating traffic control signal according to the plans and these specifications.

As a minimum, two LED indicators shall be provided on the BIU front panel. One indicator shall serve a dual use: as a power on indication and as a diagnostic indicator for proper operation of the device. The second indicator shall serve as a transmit indicator illuminating each time data is transmitted.

Testing of Grounding System
The Contractor shall perform testing of the equipment grounding system in the presence of the Engineer in accordance with MassDOT Standard Specifications.

LOOP DETECTOR AMPLIFIERS AND RACK ASSEMBLIES
The detector rack assemblies shall conform to Paragraph 5.3.4 of the NEMA TS 2 Standard. The detector rack assembly shall be supplied in a Type 2 configuration as defined in Table 5-9 of the NEMA TS 2 Standard.

The loop detector amplifiers shall conform to Subsection 6.5 of the NEMA TS 2 Standard. The loop detector amplifiers supplied shall be a Type C rack, two channel units with delay and extension timing internal to each unit's channel, as defined in Table 6-1 of the NEMA TS 2 Standard. (Note: Delay and/or extension timings shall be programmed in the controllers and not on the detector amplifiers). The two-channel card rack loop amplifier units shall occupy one of the rack slots in the assembly.

The detector unit shall be capable of operating in a voltage range from 10.8 to 26.5 VDC. The unit shall operate from the cabinet's external power supply at 12 VDC.

The front portion of the detector rack shall be provided with a marker strip to allow identification of detector phase assignments. In addition to the required marker strip, the Contractor shall supply and install on the upper left-hand corner of the back of the cabinet door a laminated, pictorial diagram depicting the traffic detector amplifier channel assignments. The assignment information contained shall include approach name, phase, detector number and terminal numbers.

VEHICLE LOOP DETECTORS
Wire loop detectors shall be installed in the roadway for vehicle detection. In advance of the loop detector installation, the Contractor shall mark, on site, the loop detectors with any changes required by field conditions such as manholes. The loop detector layout shall be inspected and approved by the Engineer before the loop detectors are installed.

Loop wire shall be encased in a protected plastic tubing of PVC or polyethylene plastic, IMSA 51-5, 0.25 inches outside diameter, and the wire may have cross-linked polyethylene insulation, or it may have THHN/THWN insulation.

ITEM 815.1, 815.2 and 816.03 (Continued)

Splicing insulator shall be an approved re-enterable rigid body splice kit with a non-hardening sealing compound compatible with the wire insulation.

Splice and Connection: Splicing and connection shall be made in the pull box nearest the roadway loop sensor but not exceeding four loops per pull box.

All loops included in a detector group as shown on the plans shall be spliced in a single pull box. Each lead and lead-in connector shall be stripped back and spliced using a pressure type wire connector applied with a crimping tool. Multiple loop sensors shall be identified as detailed on the plans.

Lead-in splicing shall be staggered to prevent contact with each other. Each crimped splice shall be soldered and insulated. The insulation material shall be heat-shrinked polyolefin. The shielded lead-in cable outer jacket and shield shall be stripped back sufficiently to ensure that the shield cannot come into contact with the spliced conductors. Follow the instructions of the kit manufacturer for this procedure when installing the re-enterable splice kit.

NOTE: The above splice shall be done on the day of the loop wire installation to prevent the entrance of any moisture into the plastic tubing.

The lead-in conductors shall be connected to the appropriate terminals in the controller cabinet, by using crimped or soldered terminal ends. The heat source for soldering shall be electrical not exceeding 30W capacity.

EMERGENCY VEHICLE PREEMPTION

A new side-mounted utility cabinet shall be installed at the proposed signalized intersection location to house the emergency vehicle preemption equipment (phase selectors, card rack, etc.). The utility cabinet shall be side mounted to the controller cabinet with wire / electronic connectivity between both the utility cabinet and the controller cabinet. The cabinet shall be similar in size to a standard flasher cabinet. The utility cabinet shall be made of aluminum and painted grey. The cabinet shall be equipped with filter vents or equivalent air ventilation system. The main door shall provide a lock to be opened with a standard police key and dust cover. The cabinet shall be approximately 16-inches W, 18-inches H, and 15-inches D. The dimensions may vary slightly by manufacturer.

The emergency vehicle preemption control system shall consist of a data-encoded phase selector to be installed within the utility cabinet. This unit will serve to validate, identify, classify and record the signal from the optical detectors located on support structures at the intersection. Upon receiving a valid signal from the detector, the phase selector shall generate a preempt call to the controller initiating a preemption operation as shown on the plans.

The optical detectors shall be single input, single output units used to control one approach. All traffic signal installations shall be supplied with a minimum of two optical detectors unless otherwise noted on the traffic signal plans. The preemption cable shall be run on a separate cable, not on the spare signal cable.

ITEM 815.1, 815.2 and 816.03 (Continued)

The phase selector shall be a rack-mounted plug-in two or four channel, dual priority device. The phase selector shall plug into a shelf-mounted single card slot chassis. Programming the phase selector shall be via a PC-based computer utilizing unit specific software. One copy of software, on CD shall be supplied and licensed to the Town of Mendon. A hard copy of final programming data shall be left in the side cabinet. The Contractor shall supply a complete set of interface cables for phase selector to laptop connection.

The Contractor shall install confirmation strobe(s) at the traffic signal location as shown on the traffic signal plans. The confirmation strobe shall serve to validate to the driver of the emergency vehicle that the traffic signal has recognized the preemption call and will initiate the proper preemption sequence. The confirmation strobe shall have a clear/white lens. The confirmation strobe shall run on a separate signal cable. The confirmation strobe shall flash only when the pre-empted phase signal head shows green.

The Contractor shall be responsible for the proper programming of the phase selector, orientation of the optical detectors, and all other work necessary to provide a complete and operating emergency vehicle preemption system. The Contractor may be required to field adjust the location of the optical detectors in the presence of the Engineer, a representative from the Town and MassDOT to properly detect preemption calls from approaching vehicles.

The emergency vehicle preemption systems shall be maintained by the Town at the completion of construction and acceptance of the traffic signals.

POLES AND FOUNDATIONS

Poles and foundations shall be fabricated and constructed in conformance with the MassDOT Standard Drawings. Foundation shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is not impaired.

SIGNAL HEADS

Signal heads mounted overhead shall be ridged mounted. All signal heads shall be equipped with ball and/or arrow light emitting diode (LED) modules. ¾ Tunnel visors shall be provided on all proposed signal heads. 5-inch solid non-louvered backplates shall be provided for proposed signal heads.

TRAFFIC SIGNAL LEDMODULE

All signal and pedestrian displays shall be equipped with LED signal modules. All red, amber, green, and pedestrian signal housings with the exception of optically programmed and fiber optic housings and shall conform to the following where applicable:

- ITE's Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Arrow Traffic Signal Supplement, Dated July 1, 2007
- ITE's Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement, Dated June 27, 2005.
- ITE's Pedestrian and Countdown Signal Modules Compliant to PTCSI - Part 2 Light Emitting Diode (LED), Dated, February 2011
- On the MassDOT Traffic Signal Approved Equipment List

For an LED module to installed on this project, the LED module shall have approval from the MassDOT Traffic Control Products Approved Equipment Committee and be included on the Traffic Control Products List prior to the date of this proposal

To prevent the LED module warranty from being voided, the connecting leads on the module shall not be cut. The original LED module leads shall be connected to the signal head terminal block as continuous wire without splices.

The LED signal module will be replaced or repaired by the manufacturer if it exhibits one of the following:

- A failure due to workmanship or material defects within the first 60 months of field operation.
- A greater than 40 percent light output degradation or a fall below the minimum intensity levels (as defined by the latest ITE performance specifications) within the first 36 months of field operation

- the first 36 months of field operation)

PEDESTRIAN HEADS WITH COUNTDOWN TIMERS

All pedestrian heads shall be 16-inch, single units, with countdown timers, Pedestrian head indications shall be illuminated L.E.D. type displaying graphical symbols of a walking person and/or upraised hand. The countdown module shall display the number of seconds remaining throughout the pedestrian flashing "DON'T WALK" interval, and blank out during the steady "DON'T WALK" interval. The countdown module shall be automatically set by the intersection controller based upon the "WALK" and "DON'T WALK" signal intervals only. The countdown module shall continuously monitor the intersection controller for any changes to the pedestrian phase timing and reprogram itself automatically. All LED indications on the pedestrian signal shall have an automatic dimming circuit for night illumination to reduce long-term degradation to the LEDs

APS PUSH BUTTONS

Pedestrian push button controls shall be raised from or flush with their housings and shall be a minimum of 2 inches in the smallest dimension. The force required to activate the controls shall be no greater than 5 pounds.

Each push button shall be complemented with an audible and vibro-tactile indication with LED confirmation light. Each separately phased pedestrian movement shall have its own distinctive audible emanation in order for visually impaired pedestrians to discriminate which phase is appropriate given his or her destination and/or direction of travel.

The audible emanation shall be a percussion type sound. No buzzer or ringing type sounds will be acceptable. The output level of the audible pedestrian signal shall vary in intensity with significant fluctuations in ambient noise conditions. At a minimum, the output level shall vary in intensity from daytime to nighttime operations.

ITEM 815.1, 815.2 and 816.03 (Continued)

Pedestrian push buttons shall be located as close as practicable to the sidewalk curb ramp serving the controlled crossing and shall permit operation from a clear ground space. If two crosswalks, oriented in different directions, end at or near the same location, the positioning of pedestrian

pushbuttons and/or legends on the pedestrian push button signs should clearly indicate which crosswalk signal is actuated by each pedestrian push button.

A maximum mounting height of 42 inches above the finish sidewalk grade shall be used for pedestrian push buttons.

Where a parallel approach is provided, push buttons shall be within 10 inches horizontally and centered on the clear ground space. Push button extenders shall be used where necessary to meet the reach requirements set forth in the Massachusetts AAB and ADA rules and regulations.

POSTS AND BASES

Signal posts and bases shall be steel shafts with transformer bases. Signal base foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged person is impaired.

MAST ARM, POLES AND FOUNDATIONS

Mast arm foundations shall not obstruct a sidewalk so that passage by physically challenged persons is not impaired. Mast arm, poles and foundations shall be fabricated and constructed in conformance with MassDOT's Overhead Signal Structure & Foundation Standard Drawings dated December 2015 and Engineering Directive E-16-001 dated 01/29/2016.

All mast arm poles shall be galvanized steel monolevers with shoe bases, unless otherwise directed. Acceptance of Type II mast arm poles shall be contingent upon review and approval of the shop drawings submitted by the Contractor. The Contractor is not required to submit load calculations for mast arm designs that conform to the 2015 MassDOT Standard Drawings. Shop drawings should be limited to identifying the dimensions of each mast arm and foundation.

Any mast arm pole that deviates from the MassDOT's Standard drawings shall require the submission of longhand design calculations by the Contractor with the shop drawings. The Contractor shall provide a set of calculations, stamped by a Structural Engineer registered in the Commonwealth of Massachusetts, along with plans and specifications for the poles for review by the Project Engineer. Mast arms shall be designed to withstand a 110 mph wind load.

The pole and arm shafts shall be fabricated from commercial quality hot rolled steel. For mast arms that is 40' and shorter in length, the shafts shall have only one (1) longitudinal, automatically, electrically welded joint, and shall have no intermediate horizontal joints or welds. Only one (1) length of steel sheet shall be used, which shall be formed into a continuously tapered shaft, having a taper length of 0.14" per foot. For mast arms that is 45' and greater in length, the arm shaft shall have telescopic field splice and the minimum splice length shall be at least 1.5 times the inside diameter of the exposed end of the female section.

ITEM 815.1, 815.2 and 816.03 (Continued)

Based on the soil boring logs and the blow counts, the foundations shall be to the depths noted below. During construction of the cored pier foundation (drilled shaft), a temporary casing, that will be removed when concrete is placed, will be required to prevent collapse of the fill and sand. Drilling for the pier foundation is anticipated to encounter cobbles and possibly boulders. When the drilling operations are complete, concrete should be placed inside the casing as soon as possible. The concrete should be placed using a tremie pipe. It is recommended pouring the pier foundation concrete on the same day that the pier is drilled. See the Appendix for soil boring logs.

Boring Log (Soil Type)	Location	Mast Arm	Foundation Depth	Diameter	Vertical Bars	Tie Bars
B1 Wet sand (dense)	STA 210+94.3, 39.5' LT	30'	9'0"	3'6"	18 - #8	#5 @ 12"
B2 Wet sand (dense)	STA 211+68.7, 29.5' RT	40'	10'6"	3'6"	18 - #8	#5 @ 9"
B4 Wet sand (loose)	STA 242+42.2, 16.9' RT	20'	9'6"	3'6"	18 - #8	#5 @ 12"
B5 Wet sand (loose)	STA 242+50.2, 35.0' LT	25'	11'6"	3'6"	18 - #8	#5 @ 12"
*B6	STA 255+10.3, 39.1' LT	35'	11'3"	3'6"	18 - #8	#5 @ 6"
*B7	STA 900+51.0, 23.1' RT	40'	12'9"	3'6"	18 - #8	#5 @ 6"
B8 Wet sand (dense)	STA 800+66.0, 49.7' RT	50'	11'6"	4'0"	18 - #9	#5 @ 9"
*B9	STA 256+16.9, 27.0' RT	35'	11'9"	3'6"	18 - #8	#5 @ 6"

*Borings encountered rock. See special design detail on the Construction Plans and special design in the Geotechnical Report dated July 2024.

Foundations for Signal Posts, Mast Arm Poles, Strain Poles and Controller Cabinets foundations shall be constructed using 4000 psi 565 Cement Concrete Masonry conforming to the relevant provisions of Section M4 of the Standard Specifications and the following:

1. Reinforcing steel shall be ASTM A-615, Grade 60.

2. The top forming of cast-in-place units shall extend downward for a minimum of 24" on the side of any foundation. The lower portions of all foundations shall be placed directly against undisturbed earth. No forms or reinforcing for foundations for mast arm poles, span wire poles and control cabinets shall be set nor shall concrete be placed until the excavation has been inspected by the Engineer and his approval to proceed has been given.

ITEM 815.1, 815.2 and 816.03 (Continued)

PAINTING

All new traffic signal equipment shall be painted in accordance with the relevant provision of Section 815 of the Standard Specifications and the following:

Controller cabinet	(Exterior)	-	Painted Grey
	(Interior)	-	Aluminum
Posts and Bases		-	Galvanized Steel
		-	Cast Iron
Mast Arms and Poles		-	Galvanized Steel
Signal housings	(Back)	-	Yellow
	(Front)	-	Flat Black
Signal housing supports		-	Yellow
Visors of signal housing	(Outside)	-	Yellow
	(Inside)	-	Flat Black
Back Plates		-	Flat Black
Meter socket		-	Aluminum

DATA BASE PROGRAMMING

Each programmable local hardware component (traffic signal controller, detector amplifier) shall be initially programmed by the Contractor based on information contained on the plans. Three sets of hard copy programming per device shall be supplied.

CONSTRUCTION METHODS

Once The Contractor begins construction within the project area, it shall then be his responsibility to operate and maintain the traffic signal system at each location. The Contractor shall provide temporary pedestrian and vehicle signals with all required equipment to power and operate if a mid-block crossing is to be introduced. The Contractor is responsible for the cost of electricity for each traffic signal for the duration of the work until the acceptance of the work by MassDOT.

The Contractor shall be required to keep records of dates when traffic signal posts are installed and when traffic signals are put on flashing and stop and go. These records are to be submitted to the Engineer by the first of each month.

ITEM 815.1, 815.2 and 816.03 (Continued)

Any temporary installations shall be in conformance with the MUTCD at all times. If an existing signal is to be turned off temporarily to allow controller switch overs or rewiring, police detail(s) shall be used to control traffic at the intersection.

The Contractor shall schedule his/her work to prevent/reduce unreasonable and unnecessary traffic congestion by installing and have ready for operation new traffic signal equipment before removing existing traffic signal equipment.

If required, The Contractor shall make all electrical arrangements with National Grid Electric for providing service to the controllers. The Contractor shall supply and install the conduit and wires to the National Grid Electric system under the supervision of National Grid Electric. The Contractor will be required to pay directly to the company, all charges resulting from, at no additional cost to the City above the lump sum bid for this contract. The Contractor, or his agent, will not cause any of his personnel to work in an electric manhole or on a pole without permission of National Grid Electric.

The Contractor shall coordinate work with local utilities to adjust, rebuild, reset, or relocate all private utilities required by the scope of work and as directed by the engineer. No additional compensation or extension of time shall be granted due to any delays that may result from failure to relocate utilities in a timely fashion, except as provided for under Subsection 8.10B5.

AS BUILT PLANS

It will be the responsibility of the contractor to provide As-Built traffic signal layout plans, indicating all signal equipment, detectors, conduits, pull boxes, complete with as-built timing and sequence, major item list, power-pole number and meter number.

The Contractor shall provide the final As-Built in hard copy form and electronic AUTOCAD files (AUTOCAD 2016 .dwg and. dwf) and electronic PDF files to MassDOT District 3 Traffic Engineer prior to the Final Acceptance of the signal system. If desired, the Contractor may hire an Engineer or the Design Engineer for a fee for preparing the electronic version. These plans shall also be delivered to MassDOT District 3 prior to the final acceptance of the project.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 815.1, 815.2, and 816.03 will be measured and paid for at the contract unit price per Lump Sum. These prices shall include all labor, material, equipment and incidental costs required to complete the work.

The maintenance of the existing installation, the removal and stacking of existing traffic signal equipment, and project restoration shall be included in pay Item 815.1, 815.2 and 816.03.

3 Inch Electrical Conduit Type NM – Plastic – (UL), Electric Handhole – SD2.022 (13”x24”), and Pullbox 12x12 Inches – SD2.031 will be measured and paid for separately under contract Items 804.3, 811.22, and 811.31 respectively.

ITEM 823.71 HIGHWAY LIGHTING POLE AND LUMINAIRE REMOVED AND STACKED EACH

The work under these Items shall conform to the relevant provisions of Sections 120 and 800 of the Standard Specifications, the General Lighting Requirements, and the following:

The work to be done under these items shall consist of the dismantling, removing, and stacking of existing light poles along Route 16, all associated hardware, associated metal halide and high pressure sodium (HPS) luminaires designated for removal as shown on the plans and/or as required by the Engineer. All Highway Lighting Poles and Luminaires removed and stacked shall be stored at the Mendon Highway Department at 66 Providence Street, Mendon, MA 01756.

Existing light poles that are owned and operated by National Grid, the Contractor must provide the necessary coordination with National grid for the removal of existing Cobra Head type light fixtures and circuitry along Route 16. The Contractor shall notify National Grid prior to and at the completion of the above work. Lighting poles that are to be retained shall be selected by National Grid and the location of the stacked light pole shall be coordinated with National Grid. All poles and luminaires not selected to be retained will become property of the Contractor and removed from the project with no additional compensation.

Any light pole, luminaire, or hardware selected to be retained that is damaged or lost either directly or indirectly as a result of the Contractor's operations shall be replaced by the Contractor at his own expense.

The contractor is responsible for any electrical work required in order to remove the light pole connections. Lighting poles and luminaires shall be disconnected by a licensed electrician, licensed in the Commonwealth of Massachusetts.

METHOD OF MEASUREMENT

Item 823.71 Highway Lighting Pole and Luminaire Removed and Stacked will be measured for payment by the Each highway lighting pole and luminaire removed and stacked as specified above.

BASIS OF PAYMENT

Item 823.71 will be paid for at the respective Contract unit prices per Each highway lighting pole and luminaire, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

ITEM 823.72 PRIVATE LIGHTING POLE AND LUMINAIRE REMOVED AND STACKED EACH

The work under these Items shall conform to the relevant provisions of Sections 120 and 800 of the Standard Specifications, the General Lighting Requirements, and the following:

The work to be done under these items shall consist of the dismantling, removing, and stacking of existing private light poles along Route 16, all associated hardware, associated metal halide and high pressure sodium (HPS) luminaires designated for removal as shown on the plans and/or as required by the Engineer.

All Private Lighting Poles and Luminaires removed and stacked shall be stored at the direction of the property owner from which it is removed. Any private poles called to be removed and stacked are encroaching on the state highway layout. It is the responsibility of the Contractor to coordinate with each respective property owner regarding the stockpile location and removal.

Any light pole, luminaire, or hardware selected to be retained that is damaged or lost either directly or indirectly as a result of the Contractor's operations shall be replaced by the Contractor at his own expense.

The contractor is responsible for any electrical work required in order to remove the light pole connections. Lighting poles and luminaires shall be disconnected by a licensed electrician, licensed in the Commonwealth of Massachusetts.

METHOD OF MEASUREMENT

Item 823.72 Private Lighting Pole and Luminaire Removed and Stacked will be measured for payment by the Each private lighting pole and luminaire removed and stacked as specified above.

BASIS OF PAYMENT

Item 823.72 will be paid for at the Contract unit price per Each private lighting pole and luminaire, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

ITEM 825.2 RRFB (2-POST ASSEMBLY SYSTEM) EACH

Location 1: Route 16 at Hopedale Town Line
Location 2: Route 16 at Elm Street

The work under these items shall conform to the relevant provisions of Section 825 of the Standard Specifications and the following:

The work shall include furnishing and installing a hard-wired, pedestrian actuated, rectangular rapid flashing beacon (RRFB) system at the locations listed above and shown in the plans.

All work shall be in accordance with MassDOT Standard Specifications and as shown on the plans and in the special note for these item numbers.

MATERIALS

Each hard-wired RRFB system shall include the following additional components:

- Electrical conduit and wiring
- Junction boxes

All mounting and supporting hardware and wiring necessary to complete a working system. All components shall be listed on the Qualified Traffic Control Equipment List.

TRAFFIC SIGNAL SERVICE CONNECTIONS

Any work involving the removal and connection of the power service shall be coordinated with the utility company. All service connection work shall be incidental to the Contract unit price bid.

See Section 813.63 of the Standard Specifications for additional requirements.

The Contractor shall coordinate with the servicing utility company for installation of a new service meter to the new controller cabinet.

Service connections shown on the plans are approximate only. The Contractor shall determine exact locations from the servicing utility, arrange to complete the service connections, and be responsible for all charges incidental thereto.

A 100-ampere meter socket approved by the servicing utility company shall be furnished and installed on the side of the control cabinet by the serving utility company.

A 3” PVC Conduit shall be installed from the controller cabinet to the utility pole and/or electric manhole, which will supply electrical service to the controller cabinet. See the plans for conduit trench details.

The Traffic Signal Service Connection detail is provided in the Appendix.

ITEM 825.2 (Continued)

CONSTRUCTION METHODS

No work shall commence until the shop drawings are approved. Layout and design of the RRFB system shall conform to the plans.

The Contractor shall diagnose and replace any part of the pedestrian activated warning system that is found to be defective in workmanship, material, or manner of functioning within six months of final acceptance by the Engineer. This requirement does not supersede the one-year warranty period on materials specified in Subsection 815.20.

METHOD OF MEASUREMENT

Item 825.2 will be measured for payment by EACH furnished and installed.

BASIS OF PAYMENT

Item 823.72 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

ITEM 831.11 ROADSIDE GUIDE SIGN (MA-D1-XX) ALUMINUM PANEL (TYPE A) SQUARE FOOT

Work under this Item shall be in accordance with the relevant provisions of Subsection 828 of the Standard Specifications and the following:

Work under this Item shall consist of fabricating and installing new 0.250 inch thick Type A (sheet) aluminum signs as indicated on the plans or as directed by the Engineer. Signs shall be installed on new support posts.

METHOD OF MEASUREMENT

Item 831.11 Roadside Guide Sign (MA-D1-XX) – Aluminum Panel Type A will be measured for payment by the actual Square Foot of guide sign panel installed, complete in place.

BASIS OF PAYMENT

Item 831.11 will be paid for at the Contract unit bid price per Square Foot, which price shall include all labor, materials, equipment, all incidental costs required to complete the work, providing new brackets and other hardware required to install signs onto new sign supports.

New sign supports shall be paid for under Item 841.11.

ITEM 841.11 SUPPORT FOR GUIDE SIGN (MA-D1-XX) - 5 INCH TUBULAR - STEEL EACH

Work under this Item shall be in accordance with the relevant provisions of Section 840 of the Standard Specifications and the following:

Work under this Item shall consist of fabricating and installing new 5-inch tubular sign supports with breakaway slip bases in 4000 PSI concrete foundations as indicated on the plans or as directed by the Engineer.

METHOD OF MEASUREMENT

Item 841.11 Support for Guide Sign (MA-D1-XX) 5 Inch Tubular – Steel will be measured for payment by each support post installed, complete in place.

BASIS OF PAYMENT

Item 841.11 will be paid for at the Contract unit bid price per Square Foot, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

New sign panels shall be paid for under Item 831.11.

ITEM 852.11 TEMPORARY PEDESTRIAN BARRICADE FOOT
ITEM 852.12 TEMPORARY PEDESTRIAN CURB RAMP EACH

DESCRIPTION

Work under these items consist of furnishing, deploying, maintaining in proper operating conditions, and removing temporary pedestrian barricades and temporary pedestrian ramps as part of a Temporary Pedestrian Access Route (TPAR) in order to guide pedestrians around a fully- or partially closed sidewalk. These devices are intended to prevent pedestrians from entering the work area and to prevent pedestrians from inadvertently entering the vehicle travel lane by providing visual and physical separation between each space.

MATERIALS

The Temporary Pedestrian Barricade shall have a continuous bottom rail or edge no more than two (2) inches above the ground and eight (8) inches in height (minimum) to accommodate cane users, have a smooth and continuous hand railing along the top edge no less than 32 inches above the ground and not obstruct or project into the pedestrian path of travel. Barricade walls shall be nearly vertical and generally within the same plane.

If exposed to traffic, Temporary Pedestrian Barricades shall be crashworthy.

The Temporary Pedestrian Curb Ramp shall provide a 48-inch minimum width, with a firm, stable, and non-slip surface. Protective edging with a two (2) inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of six (6) inches or greater.

The Temporary Pedestrian Curb Ramp walkway and landing area surface shall be of a solid, continuous, contrasting color abutting up to the existing sidewalk.

If a Temporary Pedestrian Curb Ramp leads to a crosswalk, a detectable warning pad must be used at the base of the ramp; if it leads to a protected path that does not conflict with vehicular traffic then a detectable pad shall not be used.

CONSTRUCTION METHODS

The Temporary Pedestrian Barricade shall be placed in an area that will provide pedestrians with a TPAR on a smooth, continuous hard surface for its entirety. The geometry and alignment of the facility shall meet the applicable requirements of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities" and the Massachusetts Architectural Access Board.

The recommended width of the TPAR is 60 inches, but if constraints exist a minimum clear width of 48 inches shall be provided along its entirety. If a 60 inch width cannot be accommodated in full, a 60 inch by 60 inch passing space shall be provided every 200 feet or less along the TPAR.

Turning areas shall be 60 inches by 60 inches minimum.

ITEM 852.11 and 852.12 (Continued)

Lateral joints between any surfaces shall not exceed 0.5 inches. Lateral edges may be vertical up to 0.25 inches high and shall be beveled at 1V:2H between 0.25 inches and 0.5 inches.

The TPAR shall be kept clear of debris, snow, and ice and the Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall not obstruct drainage.

Removal and/or resetting of Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall be considered incidental.

COMPENSATION

Payment for Temporary Pedestrian Barricades will be made at the contract price per linear foot installed in place, including all incidental items. This price shall include the cost of furnishing, installing, resetting, removal, and maintaining in good working condition.

Payment for Temporary Pedestrian Curb Ramps will be made at the contract price per each unit installed in place, including all incidental items. This price shall include the cost of furnishing, installing, resetting, removal, and maintaining in good working condition.

ITEM 853.33 TEMPORARY BARRIER – LIMITED DEFLECTION (TL-3) FOOT

Work under this item will conform to the relevant provisions of Section 850 and will consist of furnishing, installing, maintaining and final removal of limited deflection TL-3 temporary barrier systems for channelization of traffic and/or work zone protection. Limited deflection TL-3 temporary barrier systems will have a maximum dynamic deflection of 18 inches in HMA and in all cases the clear area available behind the barrier will be greater than the dynamic deflection of the limited deflection barrier system.

MATERIALS

The Contractor will use a temporary limited deflection barrier system that is listed on the Qualified Traffic Control Equipment List.

The Contractor may submit alternate materials to the Engineer for approval if the temporary limited deflection barrier system meets the following criteria:

1. The system has been tested by an independent laboratory that is accredited by FHWA to crash test roadside hardware;
2. The system meets the minimum requirements of the AASHTO *Manual on Assessing Safety Hardware* (MASH) at Test Level (TL) 3 or higher; and
3. The system has a federal-aid eligibility letter from FHWA.

Copies of the testing results and the federal-aid eligibility letter will be submitted and approved by the Engineer prior to procurement of an alternate temporary limited deflection barrier system.

The Contractor will supply shop drawings to confirm the available clear area behind the limited deflection barrier equals or exceeds the maximum dynamic deflection of MASH Test 3-11 during testing procedures taken at an independent laboratory that is accredited by FHWA to crash test roadside hardware.

Delineators will be installed on all temporary limited deflection barrier systems in conformance with the relevant provisions of Section 850.69 and will be incidental to the temporary limited deflection barrier systems.

Temporary impact attenuators that are listed on the Qualified Traffic Control Equipment List will be used whenever a blunt end of the temporary limited deflection barrier system is facing traffic within the clear zone unless it is protected by a second barrier system or secured to a separate barrier system by a method approved by the manufacturer

ITEM 853.33 (Continued)

CONSTRUCTION METHODS

Limited deflection temporary barrier systems shall be placed in line with the drawings. Installation shall be per the manufacturer's specifications, details, and the approved shop drawings.

The Contractor will not place any breaks in the temporary limited deflection barrier system that will result in sections that are shorter than the stated minimum length-of-need (LON) under MASH Test 3-11. Exceptions will be allowed for gate systems or changeable length segments placed over expansion joints if those barrier segment types have been tested and meet the minimum requirements of MASH Test 3-11 with the adjoining limited deflection barrier system.

Within the LON section, temporary limited deflection barrier systems will only be placed on paved surfaces unless otherwise tested and certified under MASH TL-3 for those conditions.

Damage to the pavement surface caused by the temporary limited deflection barrier during installation, while in service, and/or during removal will be repaired as directed by the Engineer at the Contractor's expense.

Limited deflection temporary barrier systems that require anchorage systems shall conform to the relevant provisions of Section 850.70.

METHOD OF MEASUREMENT

Item 853.33 will be measured by the foot, in place.

BASIS OF PAYMENT

Payment for work under this item will be made at the contract price per foot for limited deflection temporary barrier installed in place, including all incidental items. This price shall include the cost of furnishing, installing, maintaining and final removal of all limited deflection temporary barrier systems.

For limited deflection temporary barrier systems that require anchorage systems, the cost of furnishing and installing the anchorage and hardware and the restoration of pavement surfaces or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the cost of the item.

Payment for limited deflection temporary barrier removed and reset will be made under Item 853.21.

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ITEM 864.31	**SLOTTED PAVEMENT MARKER ONE-WAY WHITE**	**EACH**
ITEM 864.32	**SLOTTED PAVEMENT MARKER ONE-WAY YELLOW**	**EACH**
ITEM 864.35	**SLOTTED PAVEMENT MARKER TWO-WAY YELLOW/YELLOW**	**EACH**

Work under these items shall be done in accordance in accordance with the relevant provisions o f Section 860, the relevant provisions of 1996 Traffic Standard Drawing TR.6.3 "Typical Pavement Markings for Freeways", the construction plans and the following.

The work to be done under these items consists of furnishing and installing one-way white and two-way white/red reflectorized pavement markers (slotted in pavement)

Markers shall be installed along the broken white lane lines (skip lines) at the midway point between successive skip lines at on the mainline.

Construction Methods

The work shall include cutting the tapered pavement slot to the dimensions shown on the typical details for the one-way or two-way markers, application of the manufacturer's recommended epoxy adhesive, and placing the reflectorized pavement marker in the proper position within the slot so that the reflective face is visible and perpendicular to oncoming traffic and so that the top of the marker is set 1/8± inch below the top of the adjacent pavement.

Surface preparation and installation shall be strictly in accordance with the manufacturer's instructions.

Materials

Reflectorized pavement markers shall be 3M Series 290, Ennis-Flint Stimsonite C80, Ray-O-Lite Model 2004 or an approved equal.

Method of Measurement

The number of one-way white and two-way white/red reflectorized pavement markers (slotted in pavement), completely furnished and installed, will be measured by the Unit Each as a complete installation.

Basis of Payment

One-way white and two-way white/red reflectorized pavement markers (slotted in pavement) will be paid at the contract unit price each under Item 864.31 and Item 864.33 respectively, and shall include cutting the tapered pavement slot, furnishing and installation of the reflectorized markers, including all necessary materials, labor, incidentals, and equipment to complete the work.

ITEM 866.206	**6 INCH WET REFLECTIVE RECESSED WHITE LINE (POLYUREA)**	**FOOT**
ITEM 866.212	**12 INCH WET REFLECTIVE RECESSED WHITE LINE(POLYUREA)**	**FOOT**
ITEM 867.206	**6 INCH WET REFLECTIVE RECESSED YELLOW LINE (POLYUREA)**	**FOOT**
ITEM 867.212	**12 INCH WET REFLECTIVE RECESSED YELLOW LINE (POLYUREA)**	**FOOT**

The Work under these items shall conform to the relevant provisions of Subsection 860 of the Standard Specifications and the following:

Work shall consist of grooving a slot in the pavement surface and the furnishing and installation of wet reflective polyurea pavement markings.

MATERIALS

Wet reflective polyurea pavement markings shall consist of a liquid binder, first drop beads or elements to provide dry and wet retroreflectivity, and second drop glass beads to improve the durability of the pavement marking, reduce track-free times, and provide supplementary dry retroreflectivity.

The Contractor shall use one of the following binders and first drop beads or elements, or approved equivalents:

1. 3M™ Liquid Pavement Marking Series 5000 with 3M™ All Weather Series 90 elements;
2. Epoplex GLOMARC® 90 with Potters VISIMAX® Glass Bead System; or
3. SWARCO MFUA-12 with SWARCO MEGALUX-BEADS®.

Combination of other binder and first drop bead or element series may only be used at the approval of the Engineer.

Second drop beads shall be manufactured from glass of a composition that is highly resistant to traffic wear and to the effects of weathering. If coating is required to meet the performance requirements, the second drop beads shall be coated to ensure satisfactory embedment and adhesion. Second drop beads retained on a No. 40 U.S. Standard Mesh Sieve shall have a minimum crush strength of 30 lbs. when tested in accordance with ASTM D1213.
Second drop beads shall have a minimum refractive index of 1.51 when tested in accordance with AASHTO M247.

Second drop beads passing the No. 30 sieve shall have a minimum of 75 percent true spheres when tested in accordance with ASTM D1155. All second drop beads retained on the No. 20 and No. 30 sieves shall have a minimum of 80 percent true spheres as determined by ASTM D1155.
Second drop beads shall meet the following gradation requirements when tested in accordance with ASTM D1214:

ITEM 866.206, 866.212, 867.206, 867.212 (Continued)

U.S. Standard Sieve No.	Percent Retained
20	3-10
30	15-35
50	45-75
70	0-10
Pan	0-5

CONSTRUCTION METHODS

Installation of Groove

Prior to cutting out the grooves for all recessed lines, the Contractor shall use a chalk line or other suitable method to layout the proposed pavement markings on the surface course so that the Engineer can inspect the locations. Once the Engineer has inspected and approved the proposed striping layout, the grooves for the proposed pavement markings may be cut. No pavement grooving shall be done without the prior approval of the Engineer.

Groove position shall be a minimum of 4 inches from the edge of the pavement marking to any longitudinal pavement joints. The groove shall not be installed on bridge joints, on drainage structures, or in other areas identified by the Engineer. The groove shall not be installed continuously for intermittent pavement markings, but only where markings are to be applied.

The use of gang stacked diamond cutting blades to grind a smooth square slot is required for producing all grooves. The spacers between blade cuts shall be such that there will be less than a 10 mil rise in the finished groove between the blades. The acceptability of the surface texture will be determined by the Engineer.

The diamond grinder shall have an articulating head so that the slots are installed correctly on grades and super elevated sections.

Grooves that are ground deeper or wider than the specified allowable limits shall be repaired per the direction of the Engineer at no additional cost. Grooves that are ground too shallow, too narrow, or with unacceptable rises between blade cuts shall be reground to the correct size, depth, and surface finish at no additional cost. Slots ground out of alignment shall be patched using an approved method and materials.

Grooves shall be 1 inch ± ¼ inch wider than the pavement marking material. Groove depth shall be 100 mils ±5 mils, unless otherwise approved by the Engineer. Depth shall be consistent across the full width of the groove. Depth plates shall be provided by the Contractor to the Engineer to assure that desired groove depth is achieved.

Grooves shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants. Shrouds and a vacuum apparatus shall be included as part of the grinder to remove larger pieces of pavement that are ground out. If water is used to clean the groove or the grooving process takes place during rainfall, a minimum of 24 hours of dry time is required prior to the placement of pavement markings.

ITEM 866.206, 866.212, 867.206, 867.212 (Continued)

After the depth, width, length, and surface condition has been approved by the Engineer, an air lance shall be used to remove fine particles from the groove. Air compressors shall initially be blown out away from the application area to prevent compressor condensation build-up from entering the groove. The Contractor shall prevent traffic from traversing the grooves and re-clean grooves, as necessary, prior to application of pavement markings at no additional cost to the Department.

All grooves must be given final approval by the Engineer prior to the placement of pavement markings.

Installation of Wet Reflective Polyurea

Installation of wet reflective polyurea pavement markings shall conform to the Manufacturer's specifications and the following:

Application rate for binder and all beads and elements shall consider final pavement surface composition and smoothness in advance of application to ensure proper wet film thickness and embedment of all beads and elements. The Contractor shall provide the Engineer with documentation from the Manufacturer with all recommended application rates in advance of any pavement marking installation.

The minimum uniform wet thickness for the polyurea binder shall be 25-30 mils. The line thickness shall be met across at least the middle ⅔ of the pavement marking width. Depth plates shall be provided by the Contractor to the Engineer to assure that desired thickness is achieved.

The finished white color shall be free from tint, with good opacity and visibility under both daylight and artificial light. The finished yellow color shall be defined by Federal Test Standard 595 - Color Chip Number 13538, using Federal Test Standard 141 (Method 4252). The finished lines shall be uniform in color and have clean, well-defined edges.

First and second drop beads and/or elements shall be applied in a manner that does not induce rolling or bouncing, to ensure that exposed portions of beads are free of binder material. Beads and elements should be embedded in the binder to a depth of approximately 50% of their diameter.

Drop rate for first drop bead or element shall be per the Manufacturer's specifications.

Drop rate for second drop glass bead shall be 6.4-10.2 lbs. per gallon.

Newly installed pavement markings shall be protected from tracking during the setting period per Subsection 860.63.

ITEM 866.206, 866.212, 867.206, 867.212 (Continued)

Once the installed pavement markings have been open for traffic for a minimum of 48 hours, the Contractor shall perform retroreflectance readings per the measurement and sampling procedures contained in ASTM D7585 (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments) using the Referee Evaluation Protocol found in section 6.4. The following tests shall be performed during the measurement and sampling process:

1. ASTM E1710 *(Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer);* and
2. ASTM E2177 *(Standard Test Method for Measuring the Coefficient of Retroreflected Luminance (RL) of Pavement Markings in a Standard Condition of Wetness).*

The average initial retroreflectance readings shall exceed the following minimum values:

	*White Markings	*Yellow Markings
ASTM E1710 (Dry)	475 mcd/lux/m²	375 mcd/lux/m²
ASTM E2177 (Wet Recovery)	375 mcd/lux/m²	300 mcd/lux/m²

*Observation Angle = 1.05°, Entrance Angle = 88.8°

Pavement markings with measured average initial retroreflectance readings that do not meet the specified minimum values using the procedures outlined in subsection 6.4.5 of ASTM D7585 shall be removed by a method approved by the Engineer and reapplied at no additional cost.

Pavement Marking Asset Management

Upon completion of the pavement marking installation, the following data shall be tabulated by the Contractor:

1. Retroreflectance readings, including date(s), time(s), and location(s) where readings took place;
2. Liquid binder type(s) and application rate;
3. Reflective element type and drop rate;
4. Date of groove installation;
5. Lot, batch number, or any other material identifiers and manufacturing information;
6. Date and time of final liquid marking installation;
7. Highway location (including direction) of installation;
8. Air and pavement temperature during application;
9. Measured material application thickness, depth of groove; and
10. Any other pertinent information that may assist MassDOT with Quality Control.

ITEM 866.206, 866.212, 867.206, 867.212 (Continued)

Results for all readings shall be provided within 10 business days of testing to the Engineer, with a second copy sent to:

State Traffic Engineer
Attention: Pavement Marking Installation & Testing
10 Park Plaza, Room 7210
Boston, MA 02116

The cost to prepare and submit this data shall be considered incidental to the cost of the items.

METHOD OF MEASUREMENT

Wet reflective recessed polyurea pavement markings will be measured respectively per FOOT, complete in place, as specified under Section 860.80.

BASIS OF PAYMENT

Wet reflective recessed polyurea pavement markings will be paid at the respective contract unit price per FOOT.

The contract prices shall include all material, labor, equipment and all incidental costs required to complete the work.

ITEM 874.2 TRAFFIC SIGN REMOVED AND RESET EACH

The work to be done under this Item shall conform to the requirements of Subsections 828 and 840 of the Standard Specifications and the following:

The work under this item shall include the dismantling, removal, transporting, storing and resetting of the existing signs at the location indicated on the plans. The work also includes the removal and disposal of the existing sign supports and foundations.

The Contractor shall exercise particular care in dismantling, removal, transportation and resetting of the existing signs designated to be reused. Any sign panel damaged during construction operations shall be replaced immediately at the Contractor's expense.

Signs, attachment hardware and sign support posts lost, damaged, or otherwise made unsuitable for reuse while being removed, transported, stored or reset shall be replaced with new material at no additional cost to the Department. New attachment hardware shall be furnished and installed as necessary to replace any missing or unusable existing hardware.

The work shall also include excavation (including Class "B" rock) of the existing foundations to a depth of at least 1 foot below grade outside roadways, and to a depth of 3 feet within proposed roadways, the supplying and placing of compacted gravel, the restoration to original condition of any natural features disturbed in any way or manner by the operation.

The existing signs shall not be removed and reset without permission of the Engineer.

The historical guide sign shall be removed and reset on the existing sign support from STA 255+82, 45' RT to STA 256+16, 34.3' RT.

METHOD OF MEASUREMENT

Item 874.2 will be measured per each traffic sign removed and reset as shown on the plans, complete in place.

BASIS OF PAYMENT

Item 874.2 will be paid for at the contract unit price bid per each sign removed and reset, which price shall include removal, loading, transporting, removal and disposal of the existing foundation, backfilling, area restoration and resetting all signs and all other incidental work, complete in place. Sign supports will be paid for under Item 847.1 as applicable. Restoration work required to match existing conditions shall be incidental to this Item.

ITEM 874.41 TRAFFIC SIGN REMOVED AND DISCARDED EACH

The work to be done under this Item shall conform to the requirements of Subsection 828 of the Standard Specifications and the following:

The work to be done under this item shall consist of the dismantling, removing, transporting and discarding of existing street, warning, regulatory and guide signs and their supports, as required by the Engineer.

Also included is the excavation of the existing foundations. If in the opinion of the Engineer, the existing foundation will not interfere with new construction, it may be removed to a depth of 3 feet below the existing grade under roadway surfaces and one foot below existing grade under all other surfaces. The hole shall be backfilled with gravel and compacted, and the existing surfaces restored or replaced in kind.

The existing signs shall not be removed until the new signs and structures replacing them are ready for traffic unless otherwise directed by the Engineer.

Traffic signs to be discarded shall become the property of the Contractor and shall be removed from the project site by the Contractor.

METHOD OF MEASUREMENT

Item 874.41 will be measured for payment by Each traffic sign unit removed and discarded

BASIS OF PAVEMENT

Item 874.41 will be paid at the contract unit price bid per each, which price shall included dismantling, removing, transporting and discarding of the signs and their supports, excavation and disposal of the existing foundations, supplying and placing of gravel backfill and compaction, and the restoration or replacement in kind of disturbed surfaces and all incidental costs required to complete the work.

METHOD OF MEASUREMENT

Item 874.41 will be measured for payment by Each traffic sign unit removed and discarded

BASIS OF PAVEMENT

Item 874.41 will be paid at the contract unit price bid per each, which price shall included dismantling, removing, transporting and discarding of the signs and their supports, excavation and disposal of the existing foundations, supplying and placing of gravel backfill and compaction, and the restoration or replacement in kind of disturbed surfaces and all incidental costs required to complete the work.

ITEM 874.71 BUSINESS SIGN REMOVED AND STACKED LUMP SUM

The work to be done under this Item shall conform to the requirements of Subsection 828 of the Standard Specifications and the following:

The work to be completed under this item shall consist of the dismantling, removing, transporting and stacking of existing business signs and their supports that lie wholly or partially in state Right Of Way (ROW). The signs and supports shall be stacked on the corresponding property.

Also included is the excavation of the existing foundations. If in the opinion of the Engineer, the existing foundation will not interfere with new construction, it may be removed to a depth of 3 feet below the existing grade under roadway surfaces and one foot below existing grade under all other surfaces. The hole shall be backfilled with gravel and compacted, and the existing surfaces restored or replaced in kind. The foundation shall be disposed of properly by the Contractor.

Any lighting or electrical wiring/conduit associated with the business sign that lies wholly or partially within State ROW shall be carefully removed and stacked on the corresponding property.

Business signs to be removed and stacked are located at the following station and offsets:

- 222+50 LT (New England Steak & Seafood)
- 250+10 LT (The Blessing Barn)

METHOD OF MEASUREMENT

Item 874.71 will be measured for payment by Each business sign removed and stacked

BASIS OF PAVEMENT

Item 874.71 will be paid at the contract unit price bid per each, which price shall include dismantling, removing, transporting and discarding of the signs and their supports, excavation and disposal of the existing foundations, supplying and placing of gravel backfill and compaction, and the restoration or replacement in kind of disturbed surfaces and all incidental costs required to complete the work.

ITEM 912.1 DRILLING AND GROUTING DOWELS FOOT

The work under these Items shall conform to the applicable provisions of Subsections 901 of the Standard Specifications and the following:

The work to be done under this heading shall consist of drilling and grouting holes in the existing structure for steel reinforcing dowels in concrete masonry, as shown on the Plans or as directed by the Engineer. Dowels are to be grouted in place in the new holes as part of this item.

Dowel spacing and embedment shall be as shown on the Plans.

MATERIAL

The grout to be used for these anchor bolts shall be one of the following:

1. "Sikagrout 212", as manufactured by Sika Corp. of Lyndhurst, New Jersey

2. "1107 Advantage", as manufactured by Dayton Superior of Miamisburg, Ohio

3. "5 Star Grout", as manufactured by Five Star Products, Inc. of Fairfield, Connecticut.

4. An approved equal. A copy of MassDOT's Approved Products List may be consulted and is available on its website.

Epoxy, vinyl, or polyester resin adhesives shall not be used.

The Contractor shall submit to the Engineer for approval the product data on the grout selected along with the manufacturer's recommended hole size prior to drilling and grouting the anchor bolts.

The Non-Shrink Grout shall have a minimum compression strength of 8,000 psi after 28 days as determined by testing under ASTM C 109. The grout mix shall exhibit no shrinkage on setting but may exhibit slight expansion of no more than 3% when tested by methods conforming the requirements of ASTM C 827. All grout materials shall be on the MassDOT's Approved List of Materials.

Steel reinforcing bars used for dowels shall be epoxy coated and shall meet the requirements of Section 901.

CONSTRUCTION METHODS

All holes for dowels shall be air drilled provided that the minimum edge distance of 3" is observed. Should, in the Engineer's opinion, air drilling be inappropriate due to questionable strength of the existing substrate, or insufficient edge distance, the holes shall be diamond core drilled. The inner surfaces of diamond core drilled holes shall be scored to develop sufficient keying action. The method of scoring of the hole's inner surfaces shall be subject to the approval of the Engineer.

ITEM 912.1 (Continued)

The diameter of the drilled holes shall be in accordance with the recommendations of the grout manufacturer. The holes shall be blown clear of any debris and shall have the approval of the Engineer prior to the placement of any grout material.

The drilling operation shall be performed without damage to any existing reinforcing or portion of the structure that is to remain in place. Any damage to the existing concrete that is to remain in place shall be repaired to a condition equal to or better than that existing prior to the beginning of the Contractor's operations and shall be repaired at the Contractor's expense.

The Contractor shall strictly follow the recommendations of the manufacturer for mixing and placing the grout material prior to the placement of the dowels. The Contractor shall adhere to the ACI code requirements regarding minimum and maximum temperatures while placing the grout. Any excessive grout around the hole after placement of the dowel shall be struck off smooth while the grout is still fresh.

Dowels shall be set as shown on the plans unless the Engineer permits changes. If dowels are cast in substructure concrete, templates, or other suitable means, shall be used to keep the dowels in the correct alignment and at the required embedment during concrete placement.

The Contractor shall submit the grout manufacturer's literature completely describing the product to be utilized. The materials shall be delivered clearly marked with legible and intact labels containing the manufacturer's name, brand name, and identification of the areas where temperatures conform to manufacturer's instructions and recommendations.

METHOD OF MEASUREMENT

Item 912.1 will be measured for payment at the contract unit price per foot of hole drilled and grouted for "Drilling and Grouting Dowels" complete in place and accepted by the Engineer.

BASIS OF PAYMENT

Item 912.1 will be paid at the Contract unit bid price per foot of the dowel installed, which price shall include full compensation for all design, plans, labor, materials, and equipment for furnishing, and installing necessary to complete the work including hydrophilic waterstop.

The Contractor shall have no claim for any variations in the diameter of the hole, the method of drilling the hole, or the type of grout used in anchoring the proposed dowels. The supply and installation of reinforcing steel dowels shall be considered incidental to the work performed under this item.

ITEM 950.1. TEMPORARY SHORING LUMP SUM

The work under this item shall conform to the relevant provisions of Subseections 140, 940, 950, 955, 991.1 and the following:

Under this item, the Contractor shall design, furnish and install, maintain and cut-off or remove (where approved by the Engineer) support of excavation systems to maintain the existing grades during construction. The excavation support systems proposed are shown schematically on the plans. The limits of the excavation support systems (including cofferdam) shall be determined by the Contractor and submitted for approval by the Engineer.

The Contractor is advised to conduct a field investigation prior to bidding. Contractor shall verify all conditions, dimensions and materials in the field and shall base his/her bid on his/her own findings without any additional compensation for variances from the Plans or these Special Provisions regarding actual conditions.

The excavation support system shall be determined by the Contractor and submitted for acceptance by the Engineer. Any necessary tieback anchors, deadman anchors, soil nails and/or temporary bracing are considered incidental to this item. The Contractor shall maintain/avoid/protect or relocate existing utilities as needed. The protection or relocation of existing utilities to facilitate the excavation support system is incidental to this item.

At the Contractors option, support of excavation may be utilized to complete the proposed work at other locations not noted on the plans. Any support of excavation proposed by the Contractor shall meet the requirements of this specification.

The excavation support systems provided shall be independent and not cause damage to the permanent or existing structures when removed (where approved by the Engineer).

The excavation support systems shall extend longitudinally such that the maximum slope of the excavated surface does not exceed 1 (vertical) to 1 (horizontal).

The support of excavation system shall be designed and detailed to avoid impacting the existing utilities in the vicinity of the proposed work. Any modifications to the support of excavation system to accommodate the existing utilities shall be incidental to this item.

Support members that are not removed shall be cut off at least 2 feet below finished grade or at a depth accepted by the Engineer and abandoned in place. No wood shall remain as part of the abandoned portion of the Work. All permanent and temporary support of excavation that protrudes into the soil that supports the structure shall be left in place. Supporting soil shall be defined as all soil directly below the footing contained within a series of planes that originate at the perimeter of the bottom of the footing and project down and away from the footing at an angle of 45° from the horizontal. The Contractor is responsible for control of groundwater and surface runoff drainage to allow excavation work to be performed in the dry. This work is incidental to the item and will not be considered for additional compensation. The Contractor is responsible for removing portions of the excavation support system which may interfere with staged construction as indicated on the plans.

ITEM 950.1 (Continued)

The Contractor is responsible for installation of survey deformation monitoring points (DMPs) to monitor movements that may be detrimental to performance of roadway and structures. This work is incidental to the items and will not be considered for additional compensation.

GEOTECHNICAL INSTRUMENTATION AND MONITORING

Geotechnical instrumentation and monitoring is required at the following locations for Excavation Support System.

Deformation Monitoring

The Contractor shall furnish, install, protect, replace, monitor and report on survey deformation monitoring points (DMPs) at the following locations as a minimum:

1. Where the excavation support systems extend within the zone of influence of existing roadways, structures or utilities, DMPs shall be established a minimum of one every 25 linear feet along the top of the excavation support wall, to measure horizontal displacements during the Work.
2. Utility DMPs, spaced at 25 feet on center, shall be installed and monitored on existing utilities located within 25 feet of excavation support systems.

The Contractor's registered Surveyor and Geotechnical Monitoring Consultant shall monitor and evaluate the instrumentation. The Contractor shall perform a baseline survey of each DMP consisting of two sets of independent readings prior to the beginning of excavation and demolition. During excavation, DMPs shall be monitored one time daily until excavation is complete. The Contractor shall provide survey data to the Engineer for review within 24 hours of collection of data. The number of points to be monitored daily and the frequency of monitoring may be increased or decreased in agreement with the Engineer based on the results of the monitoring. Survey data shall be reported to an accuracy of 0.01 feet.

The following Threshold and Limiting Values for monitoring points shall be used:

Monitoring Target	Threshold Value	Limiting Value
Structure DMP (hor. and vert.)	0.25 inch	0.5 inch
Utility DMP (vertical)	0.25 inch	0.5 inch
Excavation Support DMP		
horizontal	1.0 inch	2.0 inch
vertical	0.5 inch	1.0 inch

ITEM 950.1 (Continued)

The movement criteria are intended only to establish a guideline, and in no way relieve the Contractor of his responsibility for preventing detrimental movements or damage causing structural distress in the various structures, roadways, or embankment. The Contractor shall provide all measures necessary to control movements to within the established performance criteria, or to lesser amounts as required to prevent damage. The Engineer may require the Contractor to take steps to control movements to levels which are lower, at no additional cost to the Owner, if in the Engineer's opinion the measured or observed movements are detrimental or damaging.

The work shall be executed in such a manner as to prevent damage to existing structures and other public and private property and existing improvements. The Contractor shall protect existing improvements from damage caused by settlement, lateral movement, loss of ground, undermining, washout, and other potential hazards which may be initiated by underpinning operations. Damage to existing facilities shall be repaired by the Contractor at his own expense.

If a Threshold Value is reached the Contractor shall increase the instrument monitoring frequency as directed by the Engineer, install and monitor additional instruments as directed by the Engineer and implement remedial measures so the Limiting Value is not reached.

If a Limiting Value is reached the Contractor shall stop work immediately and notify the Engineer and take immediate remedial action.

EARTH AND/OR EXCAVATION SUPPORT SYSTEM REQUIREMENTS

The Contractor shall submit to the Engineer for approval an earth support system design that is designed to carry all of the applicable AASHTO loads. The earth support system must be designed and stamped by a qualified Professional Engineer registered in the Commonwealth of Massachusetts experienced in the type and complexity of excavation support required for this project. Complete detailed drawings and calculations shall be submitted to the Engineer for approval. Qualifications of the Contractor's Engineer shall be submitted with the shop drawings and design calculations. Approval of the working drawings does not relieve the Contractor of the responsibility of providing for the safety of the work and its successful completion.

The Contractor designed excavation support system shall meet the following minimum requirements:

1. The Contractor is responsible for selecting, designing, furnishing, installing, maintaining, monitoring, and removing (where applicable) the excavation support systems.
2. The excavation support systems shall be designed to safely resist all anticipated loads they may be subjected to while in place, including, but not limited to earth pressure, impact and surcharge due to highway loading, and any expected surcharge from construction vehicles (i.e. cranes). The design shall be in accordance with the latest versions published as of the opening bid date of the AASHTO LRFD Bridge Design Specifications, relevant portions of the AASHTO Guide Design Specifications for Bridge Temporary Works.

ITEM 950.1 (Continued)

The Contractor shall submit shop drawings indicating the instrumentation and monitoring point locations, sizes, material types, and installation procedures. Contractor submittals shall be acceptable to the Engineer prior to undertaking the work.

Soldier piles, if utilized, shall be pre-augured to the required depth and/or socketed into rock as necessary. Soldier piles shall be placed in pre-drilled holes and backfilled with concrete below the bottom of excavation and sand or excavatable flowable fill above the bottom of excavation. The drilling equipment and methods used for pre-augering at the soldier pile locations shall be suitable for drilling through the conditions to be encountered, without causing damage to overlying or adjacent structures, buried structures, utilities, or services. The drill hole must be open along its full length to at least the design minimum drill hole diameter prior to installing piles and backfilling the pre-augered hole after pile installation. The diameter and depth of the pre-auger shall be specified on the Contractors shop drawings.

Temporary casing will be required in caving or unstable ground to permit the shaft to be formed to the minimum design drill hole diameter. The casing shall be steel, clean, watertight, and of ample strength to withstand handling and installation induced stresses and the pressure from both fluids and surrounding earth materials without distortion.

The Contractor's proposed method(s) to provide drill hole support and to prevent detrimental ground movements shall be approved by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures, in order to maintain site conditions and stability of adjacent structures and utilities as determined by the Engineer.

Impact driving of vertical temporary earth support members shall not be permitted. The Contractor shall be advised that obstructions such as cobbles and boulders are likely to be encountered during any augering of the soldier piles. The Contractor may use an alternative temporary earth support system, which meets all of the relevant requirements and is approved by the Engineer.

Any driven system shall account for provision of Section 991.1. Any Dewatering activities as needed to allow for excavation work to be performed is included under Item 991.1 control of Water.

All materials used for the support system, whether new or used, shall be sound and free from strength-impairing defects. Steel sheet piling (if used) shall conform to the applicable requirements of Section 950. New steel piles (if used) shall conform to the applicable provisions of Section 940. Treated timber (if used) shall conform to the applicable provisions of Section 955. Steel materials used for the temporary earth support systems are permitted to remain in place at the completion of construction, provided the materials are cutoff at a depth acceptable to the Engineer. All other materials shall be removed in advance of project completion. Timber elements shall not be used in locations where they protrude into the soil that supports the existing structures and roadways.

ITEM 950.1 (Continued)

For all steel used for excavation support that will remain in place or as part of the permanent part of the work due to either construction sequencing or the contractor's convenience, all Buy America provisions shall apply. Any steel used for temporary works that does not meet Buy American provisions shall be removed prior to completion of the contract and is not allowed to remain in place or be incorporated into the permanent work.

The Contractor shall make his own evaluation of existing conditions and facilities, and of the effects of the proposed temporary earth support system and construction methods, and shall provide in his design for all loads and methods necessary to permit construction of the specified stages of the work while maintaining public safety and protecting completed work (and all third party property) from damage caused by his operations. Furnishing such plans and calculations shall not relieve the Contractor of sole responsibility for safety of the public, personnel, equipment, and structures, as well as successful project completion.

The Contractor shall take into account subsurface conditions such as soil types, water surface elevations, existing foundations to be demolished and proposed new foundations. The Contractor shall accurately locate all utility lines and structures to ensure that the proposed temporary earth support system will not interfere with any existing or proposed utilities and structures.

The plan submitted shall be sufficiently detailed so that the Contractor's method of dealing with operations and traffic shall be clearly stated within a traffic management plan. Prior to any excavation, the Engineer must approve complete detailed drawings (including traffic control plan) and complete calculations for the temporary earth support system in writing.

During the prosecution of this work, the Engineer may reject use of any method or equipment which causes vibrations that exceed specified values, or levels which may cause damage to portions of the adjacent structures. Any damage done to portions of the adjacent structures and/or utilities identified on the Plans to remain shall be replaced or repaired by the Contractor at his expense to the satisfaction of the Engineer. The provisions and requirements for vibration monitoring shall be followed during the temporary support of excavation work.

BASIS OF PAYMENT

Item 950.1 will be paid for at the Contract unit price Lump Sum, which price shall include all labor, materials, equipment, design, plans, installing, maintenance, survey deformation monitoring, surveyor, geotechnical monitoring consultant, subsequent removal temporary earth support system, and all incidental costs required to complete the work. No additional payment will be made for any temporary shoring left in place. Any driven system shall account for provision of Section 991.1. Any Dewatering activities as needed to allow for excavation work to be performed is included under Item 991.1 Control of Water.

Excavation for construction of proposed culvert shall be paid for under Item 127.1 as applicable.

Payment for Item 950.1 Shall be partial progressive payment of the Lump Sum Contract Bid Price.

ITEM 950.1 (Continued)

First payment of 50% will be made upon completion of the installation of the excavation support system to the satisfaction and approval of the Engineer.

Second payment for the remaining 50% will be made upon the removal and satisfactory disposal of the excavation support system from the project. If cut and left in place, payment will be made after this work.

ITEM 991.1 CONTROL OF WATER – STRUCTURE NO. 001 LUMP SUM

The work to be done under this Item shall conform to the relevant provisions of the Standard Specifications and the following:

The work shall consist of installing and maintaining a temporary water control system along the banks of the Muddy Brook in order to install the box culvert extension and the downgradient scour pad at STA 272+25 LT, construction of a new concrete headwall at STA 224+50 LT and the cleaning of the outlet at the existing culvert at STA 285+60 RT. The work shall include stormwater bypass and dewatering of excavations.

Prior to working in the stream bed, the Contractor will submit plans to the Engineer for approval. These plans shall depict the proposed materials and methods of controlling flow and water within the work area. This includes cofferdams, flow diversion and dewatering systems. These plans shall be in conformance with the contract plans and these specifications. The Contractor shall install all erosion control measures as depicted on the contract plans prior to proceeding with the approved water control plans. The materials and methods not specifically mentioned under this Item shall comply with the standard specifications where applicable.

The operations of Control of Water shall not cause the accumulation of siltation nor have any adverse effect to the water or the environment. The Contractor is cautioned that flow rates in the Brook and through the culvert can increase substantially during and after storm events. Control of water shall include contingencies for accommodating the increased flow during such events.

Work under this item shall include all materials, equipment and labor needed to construct and install temporary control of water systems. As part of the work, it is the responsibility of the Contractor to determine the need and extent of dewatering techniques required to control water and sediment at the site which should be maintained in the appropriate right of way constraints of the project.

Work under this Item also includes pumping operations, installation of earth berms, sandbags, filter fabrics, weirs, stone, and all other means to collect, settle, and discharge water back into the waterways during construction. As part of the work under this item, it is the responsibility of the Contractor to determine the need and extent of dewatering required.

All concrete and riprap basin construction must be performed in the dry.

The method of dewatering shall be chosen by the Contractor and approved by the Engineer and Conservation Commission. The collected water shall be pumped to a settling basin/tank where sediment (silt, fines, solids, etc.) will be allowed to settle out. Water will then be routed to a discharge area enclosed by erosion controls.

The settling basin and other equipment shall be located within the Right-of-Way.

The work associated with Control of Water is intended to allow for repairs to the existing box culvert. Control of Water work must be coordinated with the installation of the proposed culvert as the control of water measures will need to be removed prior to completion of the upstream wingwall and the backfilling operations in the area of the culvert and wingwalls.

ITEM 991.1 (Continued)

Excavation to the bottom of footing shall not exceed a temporary cut of a 1:1 slope.

The Contractor shall construct and maintain all necessary protective works; shall furnish all materials required therefore; and shall furnish, install, maintain and operate all necessary equipment for the diversion and removal of water from the work area and control of water in the work area, as stated in these specifications.

Construction of the concrete box sections and riprap basin will involve control of water and dewatering of the area. Dewatering method(s) shall be chosen by the Contractor and approved by the Engineer and Conservation Commission.

SUBMITTALS

Prior to the commencement of any work at the site, the Contractor shall submit to the Engineer for review and approval, a detailed plan for water control, including the construction of the water control system, and a sequence of outfall installation with a timetable and details specific to the construction. The submittals shall include working drawings and calculations detailing the methods and materials proposed to account for all anticipated loads and construction conditions necessary to permit the work while maintaining a safe work area and protecting property from damage.

The Water Control Plan shall include a Sedimentation and Erosion Control Plan and a Water Flow Diversion and Containment Plan. The plans shall be adequate in detail to define specifics regarding materials, sizes, connections and incidental items associated with the work, including access to the proposed work area. The furnishing of such plans shall not serve to relieve the Contractor's responsibility for the safety of the work or his responsibility for the successful completion of the project. The proposed plans submitted shall be designed and stamped by a Professional Engineer Registered in the Commonwealth of Massachusetts. The Contractor's attention is directed to the Order of Conditions included herein, for additional information on submittal requirements.

The Contractor shall make his/her own evaluation of existing conditions and water flow, the effects of his proposed temporary works and construction methods and shall provide design for all loads and construction conditions necessary to permit construction of the specified structures while maintaining public safety, and protecting completed work and all third party property from damage due to construction operations. The Contractor shall also provide a description and details of the intended methods to prevent debris from entering the brook during the entire project duration.

Sedimentation and Erosion Control Plan: The Contractor shall submit to the Engineer, plans and details of the intended sedimentation treatment basin system that will be used along with dewatering techniques, and its location at the site. All discharge resulting from dewatering activities shall be directed to temporary sedimentation treatment basins at locations approved by the Engineer. At no time shall said discharge be directly released into the Brook. The proposed plan shall include methods and equipment necessary to discharge water from the sedimentation treatment basins.

ITEM 991.1 (Continued)

Sedimentation treatment basins shall be sized appropriately to adequately dewater from the proposed work zone while allowing sufficient time for sediments to settle out of the water, and with a depth such that a minimum of 18 inches of freeboard is maintained throughout its use.

Water Flow Diversion and Containment Plan: The Contractor shall submit plans and details along with a complete description showing the proposed diversion system for control of water and dewatering plan to the Engineer for his approval prior to the start of the work. The proposed plan shall include methods and equipment necessary to perform the work and shall include water discharge methods and equipment to bring water from the work zone to sedimentation treatment basin.

CONSTRUCTION

Temporary flow barriers to divert stream flow are to be installed as shown on the construction plans to allow existing culvert removal and proposed construction. Flow barrier lines shown on the construction drawings are only intended to show approximate limits and do not represent the exact layout of an engineered system. The Contractor is responsible for the design of flow barriers. Prior to fabrication and installation of the flow barriers, the Contractor shall submit shop drawings to the Engineer for approval for all stages of construction for review and concurrence or any noted exceptions. The submittal shall be designed, stamped, and signed by a professional engineer licensed in the Commonwealth of Massachusetts.

The work shall not cause the standard turbidity in source waters used for drinking to be exceeded (this is a maximum of 10 NTU or 5 NTU greater than the background brook turbidity, whichever is higher). This standard can be determined with equipment or applied through a simple visual observation of the relative turbidity in the water. When there is visible turbidity within the stream caused by the construction, the polluting activity will cease until adequate controls can be installed to protect the stream.

Sufficient operating and stand-by pumps and equipment shall be available to dewater and keep the work areas dry during the construction period. Utility costs, and connections shall be arranged and paid for by the Contractor.

Maintenance of Temporary Flow Barriers and Erosion Controls:

1. Throughout the dewatering operations, flow barriers shall be inspected regularly by the Contractor and properly maintained. Sufficient surplus materials and equipment shall be available on site to carry out any repair work that may be required.

2. Inspection of the dewatering operations shall take place a minimum of two times daily. Repair of damages shall take place immediately. Basin outlets are to be cleaned daily. Debris shall be removed immediately. Remove sediments from the settling basin/tank when deposits reach 8 inches below the outlet invert. Dispose of sediments at a location approved by the Engineer.

ITEM 991.1 (Continued)

3. The Contractor shall inspect erosion controls that surround the outlet daily and shall immediately replace any that are damage. Placement of the basin/tank shall be determined in the field based upon site conditions in a location approved by the Engineer.

Removal of Temporary Facilities:

1. Upon completion of work, all temporary flow barriers and other protective works shall be completely removed. The Contractor shall be responsible for complete and proper diversion of water during all stages of this project and shall repair, at no additional expense, any damage to the foundations, structures, or any other part of the work caused by floods, high water, or failure of any part of the diversion of protective works for any cause whatsoever.

2. Contractor shall remove and legally dispose all of all collected sediment.

Protection of Environment:

1. Provide and maintain ditches of adequate size to collect rainfall and groundwater seepage which may enter the excavations. Divert the water sumps, so that it can be drained or pumped out of the excavations and into the settling basin/tank, as approved. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the settling basin/tank.

2. All water which has been polluted by materials such as oil, grease, cement and concrete, paints or chemicals used by the Contractor's operation shall be disposed of in an approved manner and in accordance with all applicable permits and local, state, and federal regulations.

3. If pumps are used to temporarily bypass water or to dewater residual pools or cofferdams, pump intakes shall be screened to prevent aquatic life from entering the intake.

4. The directing biologist shall determine appropriate locations for the placement of block nets, based on site characteristics and a consideration of the type and extent of planned in-water work. Field staff will be assigned the responsibility of frequently checking and maintaining the nets for accumulated debris, general stability, and proper function. A qualified biologist, or other field staff trained in safe fish handling, will be assigned the responsibility of inspecting the nets and safely capturing and relocating any impinged fish.

5. If the directing biologist has confirmed that all fish have been successfully excluded from the area, if there is no risk of entraining fish, and adequate plans are in-place to address contingencies (including a routine schedule for inspection), then pumps may be operated without a screened intake.

ITEM 991.1 (Continued)

BASIS OF PAYMENT

Item 991.1 will be paid at the Contract Unit Bid Price per Lump Sum. The first payment of the Lump Sum bid price will be made upon completion of the installation of the water control system to the satisfaction and approval of the Engineer. The second payment of the Lump Sum bid price for this Item will be made upon the removal and satisfactory disposal of the water control system from the project site at the completion of the work.

All materials' labor and equipment required for the directing biologist to complete the work in place will be incidental to Item 991.1 control of Water.

Material for construction of any kind shall not be staged within 100 feet of a wetland resource area throughout the duration of construction.

ITEM 992.33 COORDINATION OF TEMPORARY SUPPORT FOR UTILITY POLES EACH

The work shall conform to the relevant provisions of the Standard Specifications and the following:

The Contractor shall coordinate directly with National Grid to procure work order numbers for temporary holds and support of each utility pole at the locations shown on the Plans during installation of drainage infrastructure in proximity to the existing or proposed utility pole location.

National Grid shall be responsible for the temporary support of utility poles during the Contractor's activities.

The Contractor shall be responsible for all coordination and meeting the timetable set forth for temporary utility pole support by National Grid to coincide with the schedule for drainage infrastructure installation.

To initiate National Grid Electric Work Requests:
https://ngus.force.com/electric/s/ or 1-800-375-7405, Option #2

METHOD OF MEASUREMENT

Item 992.33 Coordination of Temporary Utility Pole Support will be measured for payment per each utility pole to be temporarily supported and National Grid work order number generated.

BASIS OF PAYMENT

Item 992.3 Coordination of Temporary Utility Pole Support will be paid at the contract unit bid price which price shall include full compensation for all design, plans, labor, materials, and equipment and all incidental costs required to complete the work

No additional compensation or basis for claim shall be awarded due to delays caused by the Contractor's failure to assess need and/or request temporary support in a timely manner.

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DETAIL SHEETS

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THE COMMONWEALTH OF MASSACHUSETTS
MassDOT HIGHWAY DIVISION
TEN PARK PLAZA - BOSTON, MA

PRELIMINARY ESTIMATE OF QUANTITIES – DETAIL SHEETS

CITY/TOWN: Mendon
YEAR: 2025
ROAD: Route 16
CLASS: Urban Arterial
TYPE OF PROJECT: Pavement Rehabilitation and Intersection Improvements
DATE: March 21, 2025

Earth Excavation: 17120 CY
Gravel Borrow: 10100 CY
Test Pit for Exploration: 170 CY
Pavement Milling: 35800 SY
Dense Graded Crushed Stone: 1030 CY
Crushed Stone: 195 TON
Controlled Low Strength Material - Mechanical Excavatable (101-300 PSI): 28 CY
Gravel Borrow for Bridge Foundation: 40 CY
Gravel Borrow for Backfilling Structures: 265 CY

PAVEMENT NOTES

PROPOSED STANDARD MILLING AND OVERLAY	**35,800 SY**
SURFACE COURSE:	1 1/2" SUPERPAVE SURFACE COURSE 12.5 POLYMER (SSC – 12.5-P) OVER ASPHALT EMULSION FOR TACK COAT OVER
INTERMEDIATE COURSE:	2 1/2" SUPERPAVE INTERMEDIATE COURSE 19.0 (SIC – 19.0) OVER 3" MAXIMUM SUPERPAVE LEVELING COURSE – 9.50 (SLC 9.50) AS REQUIRED AND ASPHALT EMULSION FOR TACK COAT OVER
MILLING:	4" PAVEMENT STANDARD MILLING

PROPOSED FULL DEPTH PAVEMENT	**7,614 SY**
SURFACE COURSE:	1 1/2" SUPERPAVE SURFACE COURSE - 12.5 POLYMER (SSC-12.5-P) OVER ASPHALT EMULSION FOR TACK COAT OVER
INTERMEDIATE COURSE:	2 1/2" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER ASPHALT EMULSION FOR TACK COAT OVER
BASE COURSE:	3 1/2" SUPERPAVE BASE COURSE 37.5 (SBC - 37.5) OVER
SUBBASE:	4" DENSE GRADED CRUSHED STONE BASE FOR SUBBASE OVER 8" GRAVEL BORROW, TYPE b

PROPOSED HMA PAVEMENT WIDENING – LESS THAN 4 FEET **1,224 SY**

SURFACE COURSE:	1 1/2" SUPERPAVE SURFACE COURSE - 12.5 POLYMER (SSC -12.5-P) OVER ASPHALT EMULSION FOR TACK COAT OVER
INTERMEDIATE COURSE:	2 1/2" SUPERPAVE INTERMEDIATE COURSE 19.0 (SIC-19.0) OVER ASPHALT EMULSION FOR TACK COAT OVER
BASE COURSE:	8" HIGH EARLY STRENGTH CEMENT CONCRETE
SUBBASE:	8" GRAVEL BORROW, TYPE b

PROPOSED HMA SUP (SHARED USE PATH), DRIVEWAY & HMA DRIVEWAY APRON **2,340 TON**

SURFACE COURSE:	1 1/2" SUPERPAVE SURFACE COURSE - 12.5 POLYMER (SSC-12.5-P) OVER
INTERMEDIATE COURSE:	2 1/2" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER
SUBBASE COURSE:	8" GRAVEL BORROW TYPE b

PROPOSED CEMENT CONCRETE DRIVEWAY **2,150 SY**

SURFACE COURSE:	6" CEMENT CONCRETE OVER
SUBBASE COURSE:	8" GRAVEL BORROW TYPE b

PROPOSED CEMENT CONCRETE CURB RAMPS, SIDEWALK & MEDIAN ISLAND **2,800 SY**

SURFACE COURSE:	4" CEMENT CONCRETE OVER
SUBBASE COURSE:	8" GRAVEL BORROW TYPE b

TEMPORARY PAVEMENT **175 TON**

SURFACE COURSE:	2" SUPERPAVE SURFACE COURSE 9.5 (SSC - 9.5) OVER ASPHALT EMULSION FOR TACK COAT OVER
INTERMEDIATE COURSE:	3" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER
SUBBBASE COURSE:	4" DENSE GRADED CRUSHED STONE FOR SUB-BASE OVER 8" GRAVEL BORROW TYPE b

ITEM 102.511 TREE PROTECTION – ARMORING AND PRUNING

To be used in areas of furnishing and installing temporary tree trunk protection and for limb pruning.

STA 207+22 RT, Offset 35’ (Route 16)
STA 207+64 RT, Offset 36’ (Route 16)
STA 208+08 RT, Offset 36’ (Route 16)
STA 208+22 RT, Offset 37’ (Route 16)
STA 208+53 RT, Offset 36’ (Route 16)
STA 208+81 LT, Offset 64’ (Route 16)
STA 208+97 RT, Offset 39’ (Route 16)
STA 226+37 LT, Offset 61’ (Route 16)
STA 227+73 LT, Offset 43’ (Route 16)
STA 232+78 RT, Offset 35’ (Route 16)
STA 251+14 RT, Offset 30’ (Route 16)
STA 251+54 RT. Offset 33’ (Route 16)
STA 262+93 RT, Offset 32’ (Route 16)
STA 273+19 RT. Offset 42’ (Route 16)
STA 282+21 RT, Offset 43’ (Route 16)
STA 282+35 RT, Offset 45’ (Route 16)
STA 287+39 LT, Offset 37’ (Route 16)
STA 288+30 LT, Offset 35’ (Route 16)
STA 298+42 LT, Offset 32’ (Route 16)
STA 300+48 RT, Offset 32’ (Route 16)
STA 300+95 RT, Offset 32’ (Route 16)
STA 302+13 LT, Offset 13’ (Route 16)
STA 305+96 RT, Offset 26” (Route 16)
STA 400+64 LT, Offset 61’ (Millville)
STA 400+87 LT, Offset 40’ (Millville)
STA 601+39 RT, Offset 34’ (Emerson)
STA 903+43 RT, Offset 20’ (Main)
STA 903+47 LT, Offset 25’ (Main)
STA 903+68 RT, Offset 20’ (Main)

ITEM 102.521 TREE AND PLANT PROTECTION FENCE

To be used in areas of furnishing and installing temporary tree trunk protection and for minor limb pruning or removal of lower tree limbs to prevent injury to the tree from construction equipment and activities.

STA 207+22 RT, Offset 35’ (Route 16)
STA 207+64 RT, Offset 36’ (Route 16)
STA 208+08 RT, Offset 36’ (Route 16)
STA 208+22 RT, Offset 37’ (Route 16)
STA 208+53 RT, Offset 36’ (Route 16)
STA 208+81 LT, Offset 64’ (Route 16)
STA 208+97 RT, Offset 39’ (Route 16)
STA 226+37 LT, Offset 61’ (Route 16)
STA 227+73 LT, Offset 43’ (Route 16)
STA 232+78 RT, Offset 35' (Route 16)
STA 251+14 RT, Offset 30' (Route 16)
STA 251+54 RT, Offset 33’ (Route 16)
STA 262+93 RT, Offset 32’ (Route 16)
STA 273+19 RT, Offset 42’ (Route 16)
STA 282+21 RT, Offset 43’ (Route 16)
STA 282+35 RT, Offset 45’ (Route 16)
STA 287+39 LT, Offset 37’ (Route 16)
STA 288+30 LT, Offset 35’ (Route 16)
STA 300+48 RT, Offset 32’ (Route 16)
STA 300+95 RT, Offset 32’ (Route 16)
STA 302+13 LT, Offset 13’ (Route 16)
STA 305+96 RT, Offset 26’ (Route 16)
STA 400+64 LT, Offset 61’ (Millville)
STA 400+87 LT, Offset 40’ (Millville)
STA 601+39 RT, Offset 34’ (Emerson ST)
STA 903+43 RT, Offset 20’ (Main ST)
STA 903+47 LT, Offset 25’ (Main ST)
STA 903+68 RT, Offset 20’ (Main ST)

Linear Tree Protection

STA 205+63 to STA 1000+77 RT, Offset 26’
STA 207+19 to STA 207+91 RT, Offset 30’
STA 207+96 to STA 209+08 RT, Offset 31’
STA 206+91 to STA 211+08 LT, Offset 62’
STA 257+88 to STA 258+33 RT, Offset 28’
STA 257+93 to STA 258+94 LT, Offset 37’
STA 260+52 to STA 261+43 LT, Offset 36’
STA 263+06 to STA 271+40 LT, Offset 30’
STA 281+70 to STA 282+35 LT, Offset 35’
STA 286+22 to STA 287+15 LT, Offset 36’
STA 293+05 to STA 295+16 RT, Offset 29’
STA 295+56 to STA 296+30 LT, Offset 30’
STA 299+50 to STA 300+31 LT, Offset 28’

ITEM 103. TREE REMOVED – DIAMETER UNDER 24 INCHES
For removing trees within the project limits at the following locations.

STA 207+38 LT, Offset 43’
STA 208+47 LT, Offset 58’
STA 236+65 LT, Offset 39’
STA 236+78 LT, Offset 39’
STA 236+88 LT, Offset 39’
STA 237+00 LT, Offset 38’
STA 237+89 RT, Offset 24’
STA 240+65 LT, Offset 37’
STA 240+95 LT, Offset 40’
STA 243+68 RT, Offset 31’
STA 295+05 RT, Offset 26’
STA 295+36 RT, Offset 26’
STA 700+66 RT, Offset 30’ (Maple ST)

ITEM 104. TREE REMOVED – DIAMETER 24 INCHES AND OVER
For removing trees within the project limits at the following locations.

STA 208+39 LT, Offset 51’ (Route 16)
STA 239+88 RT, Offset 28’ (Route 16)
STA 256+98 LT, Offset 34’ (Route 16)
STA 301+51 RT, Offset 24’ (Route 16)

ITEM 105. STUMP REMOVED
For removing tree stumps within the project limits at the following locations.

STA 227+55 LT, Offset 39’ (Route 16)
STA 242+06 LT, Offset 33’ (Route 16)
STA 268+70 RT, Offset 38’ (Route 16)
STA 269+08 RT, Offset 39' (Route 16)
STA 296+71 LT, Offset 25’ (Route 16)
STA 701+11 RT, Offset 22’ (Maple ST)

ITEM 160.2 CONTROLLED LOW STRENGTH MATERIAL – MECHANICAL EXCAVATABLE (101-300 PSI)
For abandonment of pipes > 15-inch diameter at the following locations. Control density fill for conduit is incidental to conduit Item.

STA 266+83.46 to STA 267+20.39, 40 FT (Route 16)
STA 262+98.86 to STA 264+05.86, 108 FT (Route 16)
STA 296+48.03 to STA 296+48.63, 6 FT (Route 16)
STA 296+48.67 to STA 298+91.06, 244 FT (Route 16)
STA 266+03.55 to STA 266+82.08, 83 FT (Route 16)
STA 243+07.94 to STA 244+50.12, 148 FT (Route 16)

ITEM 477.2 MILLED RUMBLE STRIP (TYPE C)

To be used as shown in the Pavement Marking and Signage plans and the Traffic Details.

STA 205+03 to STA 206+19 (Route 16)
STA 207+20 to STA 209+01 (Route 16)
STA 207+21 to STA 209+03 (Route 16)
STA 209+35 to STA 209+91 (Route 16)
STA 212+30 to STA 213+12 (Route 16)
STA 213+88 to STA 215+19 (Route 16)
STA 231+77 to STA 233+79 (Route 16)
STA 237+54 to STA 239+67 (Route 16)
STA 240+49 to STA 242+11 (Route 16)
STA 243+24 to STA 243+43 (Route 16)
STA 243+84 to STA 245+81 (Route 16)
STA 243+84 to STA 248+00 (Route 16)
STA 248+20 to STA 250+40 (Route 16)
STA 251+02 to STA 255+02 (Route 16)
STA 256+43 to STA 265+04 (Route 16)
STA 265+04 to STA 293+28 (Route 16)
STA 293+28 to STA 305+21 (Route 16)
STA 305+62 to STA 306+48 (Route 16)
STA 306+80 to STA 307+40 (Route 16)
STA 307+57 to STA 307+76 (Route 16)

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ITEM 482.5 SAWCUT ASPHALT PAVEMENT FOR BOX WIDENING

For saw cutting at limits of full depth pavement widening construction adjacent to existing HMA pavement.

STA 205+03 RT to STA 206+35 RT (Route 16)
STA 205+03 LT to STA 229+00 LT (Route 16)
STA 233+00 LT to STA 239+61 LT (Route 16)
STA 240+03 LT to STA 264+50 LT (Route 16)
STA 239+40 RT to STA 241+50 RT (Route 16)
STA 274+00 LT to STA 278+50 LT (Route 16)
STA 1100+17 LT to STA 1101+89 LT (Hartford Ave)
STA 1100+32 RT to STA 1100+73 RT (Hartford Ave)
STA 601+09 INT to STA 601+09 INT (Emerson St)
STA 601+09 RT to STA 601+86 RT (Emerson St)
STA 700+21 INT to STA 700+17 INT (Maple St)
STA 700+17 RT to STA 700+42 RT (Maple St)
STA 700+42 INT to STA 700+77 INT (Maple St)
STA 700+56 RT to STA 702+50 RT (Maple St)
STA 900+19 LT to STA 903+62 LT (Main St)
STA 800+07 LT to STA 801+90 LT (North Ave)
STA 800+20 RT to STA 801+97 RT (North Ave)

ITEM 580. CURB REMOVED AND RESET

To be used for the removed and reset curb along Route 16 and at intersections.

STA 1101+61 to STA 1100+22 RT (Hartford Ave)
STA 900+39 to STA 900+77 RT (Main ST)
STA 800+11 to STA 801+93 LT (North Ave)
STA 205+03 to STA 206+19 RT (Route 16)
STA 212+85 to STA 214+22 LT (Route 16)
STA 213+53 to STA 215+46 RT (Route 16)
STA 215+67 to STA 216+55 LT (Route 16)
STA 216+01 to STA 220+92 RT (Route 16)
STA 221+41 to STA 224+26 RT (Route 16)
STA 224+93 to STA 229+23 RT (Route 16)
STA 229+61 to STA 229+76 RT (Route 16)
STA 229+82 to STA 230+01 RT (Route 16)
STA 230+62 to STA 231+15 RT (Route 16)
STA 232+24 to STA 236+12 RT (Route 16)
STA 234+40 to STA 235+69 LT (Route 16)
STA 235+99 to STA 236+28 LT (Route 16)
STA 236+56 to STA 236+71 RT (Route 16)
STA 236+65 to STA 237+70 LT (Route 16)
STA 237+36 to STA 239+77 RT (Route 16)
STA 237+96 to STA 238+09 LT (Route 16)
STA 238+31 to STA 239+91 LT (Route 16)
STA 600+17 to STA 600+29 RT (Emerson St)
STA 240+42 to STA 242+82 LT (Route 16)
STA 701+27 to STA 702+26 LT (Maple St)
STA 242+94 to STA 242+94 RT (Route 16)
STA 243+13 to STA 243+32 LT (Route 16)
STA 243+47 to STA 244+40 RT (Route 16)
STA 243+90 to STA 245+40 LT (Route 16)
STA 245+70 to STA 245+80 LT (Route 16)
STA 246+25 to STA 246+58 LT (Route 16)
STA 246+71 to STA 249+18 LT (Route 16)
STA 246+88 to STA 247+43 RT (Route 16)
STA 247+91 to STA 250+53 RT (Route 16)
STA 249+61 to STA 250+23 LT (Route 16)
STA 250+69 to STA 251+33 LT (Route 16)
STA 252+00 to STA 251+69 RT (Route 16)
STA 251+79 to STA 251+84 LT (Route 16)
STA 251+87 to STA 253+50 RT (Route 16)
STA 252+02 to STA 252+79 LT (Route 16)
STA 253+03 to STA 253+16 LT (Route 16)
STA 253+59 to STA 255+01 LT (Route 16)
STA 253+63 to STA 255+04 RT (Route 16)

ITEM 582. CURB CORNER REMOVED AND RESET

To be used for the removed and reset curb corners along Route 16.

STA 257+36 RT (Route 16)
STA 257+67 RT (Route 16)
STA 259+28 RT (Route 16)
STA 259+60 RT (Route 16)
STA 260+63 RT (Route 16)
STA 261+01 RT (Route 16)
STA 261+03 RT (Route 16)
STA 261+40 RT (Route 16)
STA 262+00 RT (Route 16)
STA 262+22 RT (Route 16)
STA 262+83 RT (Route 16)
STA 263+00 RT (Route 16)
STA 263+03 RT (Route 16)
STA 263+22 RT (Route 16)
STA 263+38 RT (Route 16)
STA 295+60 RT (Route 16)
STA 295+88 RT (Route 16)
STA 297+27 RT (Route 16)
STA 297+61 RT (Route 16)
STA 297+71 RT (Route 16)
STA 297+98 RT (Route 16)
STA 306+45 RT (Route 16)
STA 306+62 RT (Route 16)

ITEM 583. EDGING REMOVED AND REST

STA 207+45 to STA 208+47 LT (Route 16)
STA 240+77 to STA 240+77 RT (Route 16)

ITEM 594. CURB REMOVED AND DISCARDED

STA 900+21 to STA 900+63 LT (Main ST)
STA 206+19 to STA 206+35 RT (Route 16)
STA 215+46 to STA 215+54 RT (Route 16)
STA 215+90 to STA 216+01 RT (Route 16)
STA 220+92 to STA 221+06 RT (Route 16)
STA 221+30 to STA 221+41 RT (Route 16)
STA 224+26 to STA 224+43 RT (Route 16)
STA 224+73 to STA 224+93 RT (Route 16)
STA 229+23 to STA 229+38 RT (Route 16)
STA 230+02 to STA 229+99 RT (Route 16)
STA 232+06 to STA 232+06 RT (Route 16)
STA 232+99 to STA 234+13 LT (Route 16)
STA 234+31 to STA 234+40 LT (Route 16)
STA 235+69 to STA 235+78 LT (Route 16)
STA 235+92 to STA 235+99 LT (Route 16)
STA 236+28 to STA 236+31 LT (Route 16)
STA 236+09 to STA 236+17 RT (Route 16)
STA 236+56 to STA 236+47 RT (Route 16)
STA 237+27 to STA 237+36 RT (Route 16)

ITEM 594. CURB REMOVED AND DISCARDED (Continued)

STA 237+70 to STA 237+81 LT (Route 16)
STA 240+25 to STA 240+42 LT (Route 16)
STA 241+00 to STA 241+30 RT (Route 16)
STA 241+82 to STA 242+26 RT (Route 16)
STA 242+82 to STA 243+13 LT (Route 16)
STA 243+32 to STA 243+43 LT (Route 16)
STA 243+38 to STA 243+47 RT (Route 16)
STA 243+83 to STA 243+90 LT (Route 16)
STA 244+35 to STA 244+41 RT (Route 16)
STA 244+66 to STA 245+50 RT (Route 16)
STA 245+40 to STA 245+48 LT (Route 16)
STA 245+38 to STA 245+62 RT (Route 16)
STA 245+60 to STA 245+70 LT (Route 16)
STA 245+80 to STA 245+88 LT (Route 16)
STA 246+15 to STA 246+25 LT (Route 16)
STA 246+88 to STA 246+88 RT (Route 16)
STA 247+43 to STA 247+49 RT (Route 16)
STA 247+82 to STA 247+91 RT (Route 16)
STA 249+18 to STA 249+22 LT (Route 16)
STA 249+51 to STA 249+61 LT (Route 16)
STA 250+23 to STA 250+33 LT (Route 16)
STA 250+53 to STA 250+65 RT (Route 16)
STA 250+59 to STA 250+69 LT (Route 16)
STA 250+93 to STA 252+00 RT (Route 16)
STA 251+84 to STA 251+87 LT (Route 16)
STA 252+79 to STA 252+81 LT (Route 16)
STA 252+94 to STA 253+03 LT (Route 16)
STA 253+16 to STA 253+22 LT (Route 16)
STA 253+46 to STA 253+59 LT (Route 16)
STA 255+01 to STA 255+39 LT (Route 16)
STA 255+04 to STA 255+34 RT (Route 16)
STA 257+13 to STA 257+28 RT (Route 16)
STA 257+33 to STA 257+30 RT (Route 16)
STA 257+62 to STA 257+94 RT (Route 16)
STA 258+09 to STA 259+28 RT (Route 16)
STA 259+61 to STA 260+61 RT (Route 16)
STA 260+62 to STA 260+62 RT (Route 16)
STA 260+96 to STA 261+09 RT (Route 16)
STA 261+32 to STA 261+99 RT (Route 16)
STA 262+17 to STA 262+82 RT (Route 16)
STA 262+95 to STA 263+29 RT (Route 16)
STA 263+33 to STA 264+19 RT (Route 16)
STA 264+54 to STA 266+68 RT (Route 16)
STA 267+79 to STA 267+87 LT (Route 16)
STA 267+86 to STA 267+96 RT (Route 16)
STA 278+42 to STA 278+55 LT (Route 16)
STA 281+06 to STA 281+22 RT (Route 16)
STA 281+50 to STA 281+57 RT (Route 16)
STA 282+50 to STA 282+72 RT (Route 16)
STA 283+00 to STA 283+13 RT (Route 16)

ITEM 594. CURB REMOVED AND DISCARDED (Continued)

STA 290+03 to STA 290+56 RT (Route 16)
STA 291+10 to STA 293+20 RT (Route 16)
STA 294+97 to STA 295+59 RT (Route 16)
STA 295+83 to STA 297+26 RT (Route 16)
STA 297+56 to STA 297+70 RT (Route 16)
STA 297+92 to STA 298+60 RT (Route 16)
STA 298+78 to STA 300+56 RT (Route 16)
STA 300+72 to STA 201+11 RT (Route 16)
STA 302+31 to STA 302+98 RT (Route 16)
STA 303+16 to STA 303+88 RT (Route 16)
STA 304+19 to STA 305+27 RT (Route 16)
STA 305+54 to STA 306+45 RT (Route 16)
STA 306+62 to STA 307+55 RT (Route 16)
STA 307+16 to STA 307+73 LT (Route 16)

ITEM 595 CURB INLET REMOVED AND DISCARDED

STA 207+52.03, Offset 19.93' LT (Route 16)
STA 210+04.92, Offset 19.64' LT (Route 16)
STA 221+55.34 Offset 19.86' LT (Route 16)
STA 227+00.86, Offset 20.36' LT (Route 16)
STA 228+85.04, Offset 19.89' RT (Route 16)
STA 230+59.20, Offset 29.58' RT (Route 16)
STA 231+37.29, Offset 21.71' LT (Route 16)
STA 232+39.30, Offset 38.02' RT (Route 16)
STA 234+36.99, Offset 23.14' LT (Route 16)
STA 236+49.65, Offset 25.28' LT (Route 16)
STA 238+57.81, Offset 16.33' RT (Route 16)
STA 238+66.86, Offset 36.77' LT (Route 16)
STA 239+56.25, Offset 21.88' LT (Route 16)
STA 244+38.05, Offset 26.74' RT (Route 16)
STA 244+44.52, Offset 17.75' LT (Route 16)
STA 244+49.64, Offset 20.26' RT (Route 16)
STA 247+40.58, Offset 13.70' LT (Route 16)
STA 248+11.74, Offset 23.45' RT (Route 16)
STA 253+22.12, Offset 35.38' LT (Route 16)
STA 253+47.40, Offset 34.73' LT (Route 16)
STA 255+25.32, Offset 15.66' LT (Route 16)
STA 255+87.87, Offset 36.28' LT (Route 16)
STA 257+66.44, Offset 18.16' RT (Route 16)
STA 261+12.50, Offset 14.12' LT (Route 16)
STA 261+73.75, Offset 16.01' RT (Route 16)
STA 263+98.45, Offset 15.23' RT (Route 16)
STA 266+03.31, Offset 14.85' LT (Route 16)
STA 266+92.32, Offset 15.34' RT (Route 16)
STA 270+51.45, Offset 21.13' RT (Route 16)
STA 270+51.33, Offset 19.08' RT (Route 16)
STA 270+52.30, Offset 12.39' LT (Route 16)
STA 272+53.78, Offset 17.39' LT (Route 16)
STA 272+54.68, Offset 12.71' LT (Route 16)
STA 272+55.35, Offset 20.39' RT (Route 16)
STA 272+55.42, Offset 18.40' RT (Route 16)
STA 274+48.89, Offset 8.67' LT (Route 16)
STA 274+49.65, Offset 14.62' LT (Route 16)
STA 274+49.08, Offset 21.74' RT (Route 16)
STA 274+89.25, Offset 8.66' LT (Route 16)
STA 274+90.54, Offset 13.98' LT (Route 16)
STA 274+99.60, Offset 21.57' RT (Route 16)
STA 275+67.04, Offset 20.77' RT (Route 16)
STA 275+67.05, Offset 22.72' RT (Route 16)
STA 296+63.57, Offset 14.23' LT (Route 16)
STA 299+88.39, Offset 14.71' RT (Route 16)

TEM 596 CURB CORNER REMOVED AND DISCARDED

STA 237+96 LT (Route 16)
STA 238+09 LT (Route 16)
STA 245+05 RT (Route 16)
STA 251+70 RT (Route 16)
STA 251+87 RT (Route 16)
STA 253+50 RT (Route 16)
STA 253+65 RT (Route 16)
STA 259+66 RT (Route 16)
STA 264+20 RT (Route 16)
STA 264+59 RT (Route 16)
STA 305+27 RT (Route 16)
STA 305+56 RT (Route 16)
STA 307+56 RT (Route 16)

ITEM 597. EDGING REMOVED AND DISCARDED

STA 206+65 to STA 206+96 RT (Route 16)
STA 207+16 to STA 208+01 RT (Route 16)
STA 208+47 to STA 210+81 LT (Route 16)
STA 209+37 to STA 210+39 RT (Route 16)
STA 210+65 to STA 212+87 RT (Route 16)
STA 213+27 to STA 213+53 RT (Route 16)
STA 255+93 to STA 255+95 (Route 16)
STA 256+01 to STA 257+22 (Route 16)
STA 257+66 to STA 256+81 (Route 16)
STA 261+60 to STA 265+18 (Route 16)
STA 296+65 to STA 298+10 (Route 16)

ITEM 630.2 HIGHWAY GUARD REMOVED AND DISCARDED

STA 205+03 to STA 205+39 LT (Route 16)
STA 224+26 to STA 226+18 LT (Route 16)
STA 267+71 to STA 279+39 RT (Route 16)
STA 269+62 to STA 275+67 LT (Route 16)
STA 275+67 to STA 278+46 LT (Route 16)
STA 279+09 to STA 280+77 LT (Route 16)
STA 279+46 to STA 279+48 RT (Route 16)
STA283+14 to STA 285+36 RT (Route 16)
STA284+51 to STA 286+24 LT (Route 16)
STA289+24 to STA 291+46 LT (Route 16)
STA291+08 to STA 294+10 RT (Route 16)
STA291+92 to STA 293+15 LT (Route 16)
STA303+04 to STA 304+40 LT (Route 16)

ITEM 655. CEDAR RAIL FENCE

STA 209+32 to STA 209+54 RT (Route 16)
STA 217+08 to STA 218+06 LT (Route 16)
STA 218+46 to STA 219+00 LT (Route 16)
STA 224+75 to STA 255+65 LT (Route 16)
STA 253+57 to STA 255+48 LT (Route 16)
STA 267+65 to STA 279+35 RT (Route 16)
STA 283+42 to STA 285+36 RT (Route 16)
STA 291+38 to STA 294+10 RT, (Route 16)

ITEM 665. CHAIN LINK FENCE REMOVED AND STACKED
STA 218+06 to STA 218+44 LT (Route 16)

ITEM 669. FENCE REMOVED AND STACKED
STA 244+65 to STA 244+87 RT (Route 16)

ITEM 669.1 FENCE REMOVED AND DISPOSED
STA 217+08 to STA 218+06 LT (Route 16)
STA 230+37 to STA 231+37 LT (Route 16)
STA 290+54 to STA 290+59 RT (Route 16)
STA 291+04 to STA 291+08 RT (Route 16)

ITEM 685. STONE MASONRY WALL IN CEMENT MORTAR
Areas for the walls were found using Wall Profile in the plan set.

Wall A STA 207+25 to 207+91 RT (Route 16)
Wall H STA 238+38 to STA 239+35 LT (Route 16)
Wall I STA 253+65 to 800+16 LT (Route 16)

ITEM 690.1 STONE MASONRY WALL REMOVED AND REBUILT DRY

STA 258+50 to STA 261+34 LT (Route 16)
STA 261+55 to STA 263+65 LT (Route 16)
STA 262+15 to STA 262+75 RT (Route 16)
STA 257+85 to STA 261+35 LT (Route 16)

ITEM 690.11 STONE MASONRY WALL REMOVED AND DISPOSED

STA 208+80 to STA 209+01 RT (Route 16)
STA 209+29 to STA 209+45 RT (Route 16)
STA 257+66 to STA 258+13 LT (Route 16)
STA 258+12 to STA 258+48 LT (Route 16)
STA 258+13 to STA 258+48 LT (Route 16)
STA 258+48 to STA 261+34 LT (Route 16)
STA 260+73 to STA 260+78 LT (Route 16)

ITEM 690.12 FLAGSTONE LANDSCAPE WALL REMOVED AND REBUILT

STA 235+87 to STA 236+34 LT (Route 16)
STA 236+55 to STA 237+10 LT (Route 16)

ITEM 701.3 MODIFICATIONS TO CONCRETE WALK AND RAILING

The volume of concrete stairs was calculate to be 0.28 CY per step. Handrail picket wrought iron fence with matte black finish 3 FT in length fits 3 steps, two railings for each side of the stairs. Modified steps are applicable at:

STA 235+49 LT, 3 Steps
STA 244+27 LT, 3 Steps
STA 245+28 LT, 3 Steps
STA 252+36 LT, 5 Steps
STA 253+41 RT, 2 Steps
STA 299+17 RT, 3 Steps

ITEM 767.121 SEDIMENT CONTROL BARRIER

STA 201+14 to STA 205+46 RT (Route 16)
STA 205+04 to STA 206+91 LT (Route 16)
STA 224+16 to STA 226+81 LT (Route 16)
STA 246+16 to STA 249+27 LT (Route 16)
STA 249+08 to STA 249+37 RT (Route 16)
STA 249+53 to STA 249+65 LT (Route 16)
STA 268+22 to STA 279+49 RT (Route 16)
STA 271+25 to STA 274+95 LT (Route 16)
STA 275+24 to STA 278+68 LT (Route 16)

ITEM 823.71 HIGHWAY LIGHTING POLE AND LUMINAIRE REMOVED AND STACKED

STA 230+37 LT (Route 16)
STA 230+88 LT (Route 16)
STA 231+40 LT (Route 16)
STA 230+17 RT (Route 16)
STA 230+65 RT (Route 16)
STA 236+14 RT (Route 16)
STA 238+40 LT (Route 16)

ITEM 831.11 ROADSIDE GUIDE SIGN (D6/D8) – ALUMINUM PANEL (TYPE A)

As shown on Traffic Sign and Pavement Marking Plans and Traffic Sign Summary.

MA-D1-5A	STA 242+36, 15’ RT	Prop Route 16 Const BL
MA-D1-6A	STA 242+36, 15’ RT	Prop Route 16 Const BL
MA-D1-5B	STA 800+78, 40’ LT	Prop Main St Const BL
MA-D1-6B	STA 800+78, 40’ LT	Prop Main St Const BL
MA-D1-5C	STA 900+45, 25’ LT	Prop North Ave Const BL
MA-D1-6C	STA 900+45, 25’ LT	Prop North Ave Const BL

ITEM 874.71 BUSINESS SIGNS REMOVED AND STACKED

The signs and supports shall be stacked on the corresponding property. Business signs to be removed and stacked are located at the following station and offsets:
222+50 LT (New England Steak & Seafood)
250+10 LT (BLESSING BARN)

ITEM 903. 3000 PSI, 1.5 INCH, 470 CEMENT CONCRETE

STA 287+80.89LT, Offset 15.60'
STA 287+84.76LT, Offset 10.80'
STA 287+91.20LT, Offset 10.12'
STA 289+44.66LT, Offset 14.00'
STA 289+48.17LT, Offset 9.90'
STA 289+54.86LT, Offset 10.00'
STA 289+58.08LT, Offset 13.48'
STA 304+87.27LT, Offset 13.07'
STA 304+90.36LT, Offset 10.61'
STA 304+95.69LT, Offset 10.79'
STA 304+98.76LT, Offset 13.41'

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DOCUMENT A00808

PROJECT UTILITY COORDINATION FORM

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Project Utilities Coordination (PUC) Form

CONTACTS AND GENERAL UTILITY INFORMATION

Revision Date:

City/Town:	Project File #:	PUC Completed by:	Utility Pole Set:	
Mendon	608491	Ross Goodale	National Grid	
Route/Street:	**Resident Engineer:**	**Mass DOT PM:**	**Scheduled Ad Date:**	**Total Poles Relocated:**
Route 16	*TBD*	Kim Sloan	7/19/2025	63 R&R New - 19 Remove- 5

3/4/2025
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Consultant:	Contact:	Office #	Cell #	Email
HNTB	James Barnack		716-912-4753	jbarnack@hntb.com

Utility Company	Contact	Office #	Cell #	Email	Scope, Budget, Duration Submitted		Reimbursement			Potential for District Initiated Early Relocation *		Utilities On Bridge/Structure		Utilities Underground (UG) /Aerial (OH)	
					Yes	No	Agreement	Non-Reimb'le	Notes	YES	NO	YES	NO	UG	OH
National Grid	Manny Munoz	401-895-9726		manuel.munoz@nationalgrid.com	X		X				X		X		X
Crown Castle	Mark Bonanno	508-616-7818		mark.bonanno@crowncastle.com	X		X				X		X		X
Town Fiber	Rod Jenks	781-890-5070 ext 6927		Rjenks@comm-tract.com	X		X		MECC FOC is on Hasting Street between Main Street and Emerson Street		X		X		X
Comcast	Wendy Brown	978-848-5163		Wendy_Brown@comcast.com	X		X				X		X		X
Verizon	Paul Styspeck	413-787-1845		paul.m.styspeck@verizon.com	X		X				X		X	X	X
Eversource Gas	Jeffrey Evans-Mongeon		802-505-5253	jeffrey.evans-mongeon@eversource.com	X		X				X		X	X	
Tennesee Gas	David Wood	860-763-6005	413-530-7117	david_wood@kindermorgan.com		X					X		X		
Tennesee Gas	Wes Maribito	508-309-9029		wesley_maribito@kindermorgan.com		X					X		X		
Mendon Highway	Alan Tetreault	508-473-0737		highwaydpt@mendonma.gov		X					X		X		
Hopedale Water	Tim Watson			twatson@hopedale-ma.gov		X			Owns the water line in Mendon		X		X		

Utility Relocation Notes for MassDOT Contractor

Unless otherwise noted by Contract, the MassDOT Contractor is to provide the District Construction Office with 7 Calendar Days advance notification in order to validate the current progress and provide the required 30 Days advance notice-to-proceed for the first Utility - and each subsequent Utility. These advance notifications are to be identified in the Contractor's Schedules (Pre-Con preparation, Baseline, Subnets, and Updated/Monthly Schedules) as specified in Subsection 8.02 (for DBB Contracts) and/or Section 9 (of DB Contracts). Note: The durations included below do not include these lead-times. See Additional 'Important Basis notes for Contractor' - on last PUC Form page.

Additional notes:

Suggested Sequence of Relocation (Based on Consultant proposed construction staging)

The sequence as detailed on the following pages is based on the consultants proposed staging plan. This information was compiled through meetings that included all of the utilities listed below along with the designer and the Town of Mendon. The information provided is the best available information prior to project advertisement.

Proposal No. 608491-131468

A00808 - 3

Is 'enabling' (prep) work, by the Contractor, necessary prior to the start of the first series of utility relocations:	Yes	No
	X	

Has any of the Utility work been identified to work concurrently	Yes	No
	X	

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massDOT Massachusetts Department of Transportation Highway Division

	RESPONSIBLE PARTY		DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work				Access Restraint & Limitations of Operations Notes	
					Contractor note: In planning and executing the work, the Access Restraints listed in the Special Provisions, takes precedence over the checklist in these 4 columns.				Should an AR be considered for the Contractor ?	
	C = Contractor	U = Utility Co.			Exclusive Utility on site: Utility working with no other Utilities in vicinity	Concurrent Utilities: Utility working with other Utilities on site	Contractor Off-Site: No Contractor physical construction operations on-site (while Utility is	Contractor Concurrent: Contractor and Utility are working on-site - but NOT in the same vicinity	Potential Access Restraint (Yes/No)	Reason/Note (optional)
	C		Enabling' work by the Contractor - Coordinate relocations with Eversource Gas. Tennessee Gas has two underground gas transmission lines crossing in the vicinity of STA 289+00± that are to be retained. Per Special Provisions contractor is coordinate any work in this area with Tennessee Gas.							
			UTILITY OPERATIONS - Underground							
Task: 1			***Eversource Gas***							
		U	FORCED ACCOUNT Gas Main Relocation on Uxbridge Rd from STA 205+10 to STA 206+90							
		U	Mobilize & Materials Delivery and Project Planning	5		x		x	No	
		U	Main Install ~180' of 8" PL main	11		x		x	No	
		U	Pig new main	2		x		x	No	
		U	Pressure test new main	2		x		x	No	
		U	Main Tie-in and prep	3		x		x	No	
		U	Service Relocations to #1 Taft Ave and Telemetry Cabinet	4		x		x	No	
		U	Abandon 8" existing main	3		x		x	No	
		U	Site Restoration, Clean-up and Demobilize	1		x		x	No	
		U	FORCED ACCOUNT Gas Main Relocation on Hastings St from STA 231+10 to STA 231+80							
		U	Mobilize & Materials Delivery and Project Planning	5		x		x	No	
		U	Main Install ~70' of 8" PL main	5		x		x	No	
		U	Pig new main	2		x		x	No	
		U	Pressure test new main	2		x		x	No	
		U	Main Tie-in and prep	3		x		x	No	
		U	Abandon 8" existing main	3		x		x	No	
		U	Site Restoration, Clean-up and Demobilize	1		x		x	No	
		U	FORCED ACCOUNT Gas Main Relocation on Hastings St from STA 234+50 to STA 248+35							
		U	Mobilize & Materials Delivery and Project Planning	5		x		x	No	
		U	Main Install ~1385' of 8" PL main	80		x		x	No	
		U	Pig new main	2		x		x	No	
		U	Pressure test new Main	5		x		x	No	
		U	Main Tie-in and prep	6		x		x	No	
		U	7 Service Tie-Overs	14		x		x	No	
		U	Tie-in to 2" PL @ STA 237+00	3		x		x	No	
		U	Tie-in to 4" PL @ STA 241+30	3		x		x	No	
		U	Tie-in to 0.5" PL @ STA 243+60	3		x		x	No	
		U	Abandon 8" existing main	3		x		x	No	
		U	Site Restoration, Clean-up and Demobilize	3		x		x	No	
		U	FORCED ACCOUNT Gas Main Relocation on Milford St from STA 269+10 to STA 273+05							
		U	Mobilize & Materials Delivery and Project Planning	5		x		x	No	
		U	Main Install ~395' of 8" PL main	22		x		x	No	
		U	Pig new main	2		x		x	No	
		U	Pressure test new main	2		x		x	No	
		U	Main Tie-in and prep	6		x		x	No	
		U	Abandon 8" existing main	3		x		x	No	
		U	Site Restoration, Clean-up and Demobilize	1		x		x	No	
		U	FORCED ACCOUNT Gas Main Relocation on Milford St from 274+65 to 275+75							
		U	Mobilize & Materials Delivery and Project Planning	5		x		x	No	
		U	Main Install ~110' of 8" PL main	11		x		x	No	
		U	Pressure test new main	2		x		x	No	
		U	Pig new main	2		x		x	No	
		U	Main Tie-in and prep	6		x		x	No	
		U	Abandon 8" existing main	3		x		x	No	
		U	Site Restoration, Clean-up and Demobilize	1		x		x	No	
		U	FORCED ACCOUNT Gas Main Relocation on Milford St from STA 287+50 to STA 296+10							
		U	Mobilize & Materials Delivery and Project Planning	5		x		x	No	
		U	Main Install ~850' of 8" PL main	48		x		x	No	

Proposal No. 608491-131468

	RESPONSIBLE PARTY		DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work Contractor note: In planning and executing the work, the Access Restraints listed in the Special Provisions, takes precedence over the checklist in these 4 columns.				Access Restraint & Limitations of Operations Notes Should an AR be considered for the Contractor ?	
	C = Contractor	U = Utility Co.			Exclusive Utility on site: Utility working with no other Utilities in vicinity	Concurrent Utilities: Utility working with other Utilities on site	Contractor Off-Site: No Contractor physical construction operations on-site (while Utility is	Contractor Concurrent: Contractor and Utility are working on-site - but NOT in the same vicinity	Potential Access Restraint (Yes/No)	Reason/Note (optional)
		U	Pig new main	2		x		x	No	
		U	Pressure test new main	2		x		x	No	
		U	Main Tie-in and prep	6		x		x	No	
		U	2 service tie-overs	4		x		x	No	
		U	Abandon 8" existing main	3		x		x	No	
		U	Site Restoration, Clean-up and Demobilize	1		x		x	No	
		U	FORCED ACCOUNT Gas Main Relocation on Milford St from STA 298+75 to STA 299+30							
		U	Mobilize & Materials Delivery and Project Planning	5		x		x	No	
		U	Main Install ~70' of 8" PL main	5		x		x	No	
		U	Pig new main	2		x		x	No	
		U	Pressure test new main	2		x		x	No	
		U	Main Tie-in and prep	3		x		x	No	
		U	Abandon 8" existing main	3		x		x	No	
		U	Site Restoration, Clean-up and Demobilize	1		x		x	No	
		U	FORCED ACCOUNT Gas Service Relocations on Milford St from STA 303+00 to STA 304+50							
		U	Mobilize & Materials Delivery and Project Planning	5		x		x	No	
		U	Main Install ~160' of 8" PL main	8		x		x	No	
		U	Pig new main	2		x		x	No	
		U	Pressure test new main	2		x		x	No	
		U	Main Tie-in and prep	3		x		x	No	
		U	Abandon 8" existing main	3		x		x	No	
		U	Site Restoration, Clean-up and Demobilize	1		x		x	No	
			Sub-Total	**366**						
	C		Enabling' work by the Contractor - At preconstruction meeting schedule a utility walkthrough to discuss pole locations and review tree trimming/removals. Prior to overhead utility relocations contractor will need to perform any necessary clearing & grubbing and tree removal as specified in Contract Documents. Survey will need to stake utility pole locations prior to utility walkthrough. Coordinate water line installation with Hopedale Water via contract items. Initiate work orders with National Grid Electric for secondary electric riser relocations. Overhead street lights are owned by National Grid and will be relocated by National Grid. There are locations where utility poles will need to be held during trench installation and CB installation. Contractor to initiate work orders and coordinate with National Grid for these locations. National Grid will be responsible to hold these poles in place. The secondary risers identified on the contract documents are to be relocated by the contractor. Contractor to intiate work orders with National Grid for the secondary electric risers. Contractor may need to perform some widening between STA 218+00±LT to STA 219+00±LT, STA STA 275+00±LT to STA 278+00±LT and STA 291+00±RT to STA 293+75±RT to allow for utility pole installation due to the proposed grade increase. Contractor may need to perform some grade cutting at STA 214+50±LT and between STA 207+50±LT to STA 209+50±LT, STA STA 257+50±LT to STA 262+00±LT and STA 230+00±LT to STA 235+50±LT to allow for utility pole installation due to the proposed grade decrease. There is an existing underground "Bell Comm" line shown on the plans. This line has been determined to be abandoned and no longer in use. The line can be removed if encountered or otherwise abandoned in place. In the intersection of North Ave/Main Street and Route 16 there are existing telephone vaults that Verizon will abandon once the overhead wires have been transferred to the new poles. Once the underground conduit is abandoned, Verizon will remove steel covers and frames and the MassDOT contractor will remove the vaults and fill with gravel borrow. The existing Verizon conduit may contain asbestos and where encountered shall be removed and disposed of by the MassDOT contractor. Widening of Route 16 in the vicinity of these vaults cannot be done until the vaults have been removed.								
			UTILITY OPERATIONS - Overhead							
Task: 1			***National Grid***							
		U	Pre-check	10		x		x	No	
		U	Tree trimming, if additional tree trimming is needed	10		x		x	No	
		U	Poles and anchors Relocated and Replaced	145		x		x	No	
		U	Electric Overhead: Reconductor/ frame poles Starting at pole 190 Uxbridge Rd to P226 Hasings St, from pole 8 Main St to pole 10 Milford St and from Pole 17 to pole 26 Milford St	180		x		x	No	
		U	Secondary: Replace seconday cable 190 Uxbridge Rd to P226 Hasings St, from pole 8 Main St to pole 10 Milford St and from Pole 17 to pole 26 Milford St	15		x		x	No	
		U	Equipment:Replace 5- 3ph transformers, 6- 1ph transformers, 3 loadbreak switches, 1 Disconnect Switch and 1- 3ph capacitor.	50		x		x	No	
		U	Outage Coordination: Commercial customers	10		x		x	No	
			Sub-Total	**420**						
Task: 2			***Crown Castle***							
		U	Install new fiber optic cables	4		x		x	No	
		U	Service affecting work customer notifications	20		x		x	No	
		U	Cutover splicing (night work)	3		x		x	No	

Proposal No. 608491-131468

	RESPONSIBLE PARTY		DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work Contractor note: In planning and executing the work, the Access Restraints listed in the Special Provisions, takes precedence over the checklist in these 4 columns.				Access Restraint & Limitations of Operations Notes Should an AR be considered for the Contractor ?	
	C = Contractor	U = Utility Co.			Exclusive Utility on site: Utility working with no other Utilities in vicinity	Concurrent Utilities: Utility working with other Utilities on site	Contractor Off-Site: No Contractor physical construction operations on-site (while Utility is	Contractor Concurrent: Contractor and Utility are working on-site - but NOT in the same vicinity	Potential Access Restraint (Yes/No)	Reason/Note (optional)
		u	Cable removal/ transfer overhead cable	5		x		x	No	
			Sub-Total	**32**						
Task: 3			***Mendon Town Fiber***							
		U	Install new 48 count single mode fiber backbone cable on new poles from proposed splice point to proposed point	2		**X**		**X**	**No**	
		u	Splice new fiber cable into existing backbone cable and testing (requires multiple splice crews to minimize down time)	1		**X**		**X**	**No**	
		u	Wreck out old fiber cable, remove all pole attchment hardware, top poles and dispose of materials	1		**X**		**X**	**No**	
			Sub-Total	**2**						
Task: 4			***Comcast***							
		u	Construct aerial strand	14		x		x	No	
		u	lash aerial coxial cables	20		x		x	No	
		u	splice all active and passive electronics	14		x		x	No	
		u	Delash all fibers from existing strand / coaxial cables	21		x		x	No	
		u	Swing and lash all fibers to new strand / coaxial cables	21		x		x	No	
		u	Wreck out of old aerial plant	14		x		x	No	
			Sub-Total	**104**						
Task: 5			***Verizon***							
		u	Place new pole to anchor guy wires on new poles	12		x		x	No	
		u	Contract work to relocate riser conduits from old to new poles. Remove frame and covers for three (3) manholes	15		x		x	No	
		u	Place new aerial/riser copper and fiber cables	62		x		x	No	
		u	Splice new aerial/riser copper and fiber cables	92		x		x	No	
		u	Place and splice new aerial terminals and drop wires	8		x		x	No	
		u	Transfer aerial cables and drop wires where possible	2		x		x	No	
		u	Trimout aerial/riser copper and fiber cables	98		x		x	No	
		u	remove network cabinets	8		x		x	No	
		u	Recon/remove drop wires	10		x		x	No	
		u	Remove aerial/riser copper and fiber cables	78		x		x	No	
		u	Remove old poles, anchors, and pole to anchor guy wires	34		x		x	No	
				419						

IMPORTANT BASIS NOTES - FOR CONTRACTOR

1	Unless otherwise specified in the MassDOT Construction Contract, or unless specifically noted within this PUC Form, these durations (herein) are based upon the Contractor providing *unimpeded access* to the Utility company to perform Utility relocations (see Note 5 - Access).
2	"Concurrent Utilities" operations noted herein, are to signify those Utility Company operations that can be worked concurrently (e.g. Utility A and Utility B work on-site together) - MassDOT and the Contractor are to prepare NTPs to Utilities accordingly.
3	"Potential Access Restraints" noted within this PUC Form are for planning purposes. See MassDOT Contract for Contractual Access Restraints (refer to Subsections 8.02, 8.03, and/or 8.06 for Design Bid Build Contracts and Volume II Section 9 for Design Build Contracts).
4	Utility non-work periods - For planning purposes, the durations above contain some non work days (contingency) for New England conditions (precipitation, high temperatures, low temperatures, snow, ice). Gas line work however, typically has a seasonal restriction and can NOT be installed from 15-November to 15-March. Municipally Owned Electric and Gas Utilities are also restricted from proceeding from 15-November to 15-March. The Contractor shall (and the CTD plan) reflect this calendar restriction within the schedule (unless otherwise note).
5	Access - Unless otherwise noted in the Contract, and in addition to the 'enabling' notes above, the Contractor must provide safe and unimpeded access (for trucks, lifts, cranes, etc.) to the Utilities, to allow for the proposed relocation(s) - including but not limited to snow removal, clearing and grubbing, guard rail removal, barrier removal, tree removal, and grading. Any costs associated with these tasks are deemed to be incidental to the project.
6	For all MassDOT construction contracts issued after January 2014, the new Utility Coordination/documentation specification is required. This is Section 8.14 in Design-Bid-Build Contracts (see Design-Build index reference for applicable section #).
7	Prior to starting any and all enabling work for Utilities, the Contractor is to plan in advance with submittals and approved durations.
8	* Potential District Initiated Early Utility Relocation - if noted herein, the District reserves the right to initiate early utility relocation in advance of the Contract NTP. In submitting a bid price and in the development/basis of the Baseline Schedule, the Contractor shall not plan the Work with the potential benefit of any form of 'early utility relocation.' As a requirement of the Baseline submission, unless otherwise noted in this Specification, the earliest that the first Utility company is to receive the 30 days advance notification to mobilize to the site, will be 7 calendar days after the pre-construction meeting and never sooner than 7 days after the Contract NTP.
9	

DOCUMENT A00810

MassDOT Herbicide Use Report

Proposal No. 608491-131468

MassDOT Herbicide Use Report

Date Submitted:

Use multiple sheets for multiple application techniques or sites as needed.

Contractor Performing Work:

Project or Contract No:

Town/s:

Associated Route:

Project Description:

MDAR ALERT*:

Treatment Description:

Area Treated (as applicable)

Acres: **Sq Yds:** **Miles:**

Weeds Targeted:

Gallons Formula Used:

Application Method:

Date/Time Began:

Date/Time End:

Product Used:

Name: _____	Name: _____	Name: _____
EPA Reg. No: _____	EPA Reg. No: _____	EPA Reg. No: _____
% Active Ingredient	% Active Ingredient	% Active Ingredient
Dry: _____	Dry: _____	Dry: _____
Liquid: _____	Liquid: _____	Liquid: _____
Formulation (dilution rate): _____	Formulation (dilution rate): _____	Formulation (dilution rate): _____

Additional products used (surfactants, etc.) or other information:

Applicators: **License Numbers:**

* Please note:
EDRR Species (MAM, Hogweed, Pepperweed, Kudzu, etc.)
Tree of Heaven 1) stands of >20 trees; 2) >5 trees near nursery, landscape company, or highway rest area where trucks stop

Upon completion, please submit form to MassDOT District Engineer and Landscape Design Section in Boston office.

07/18/2018

DOCUMENT A00811

WATERING LOG
for
MassDOT Plantings

Watering Log for MassDOT Plantings

Project Description:

Contract No:

Project No:

Plant Locations/s: (Attach planting plan/s as necessary)

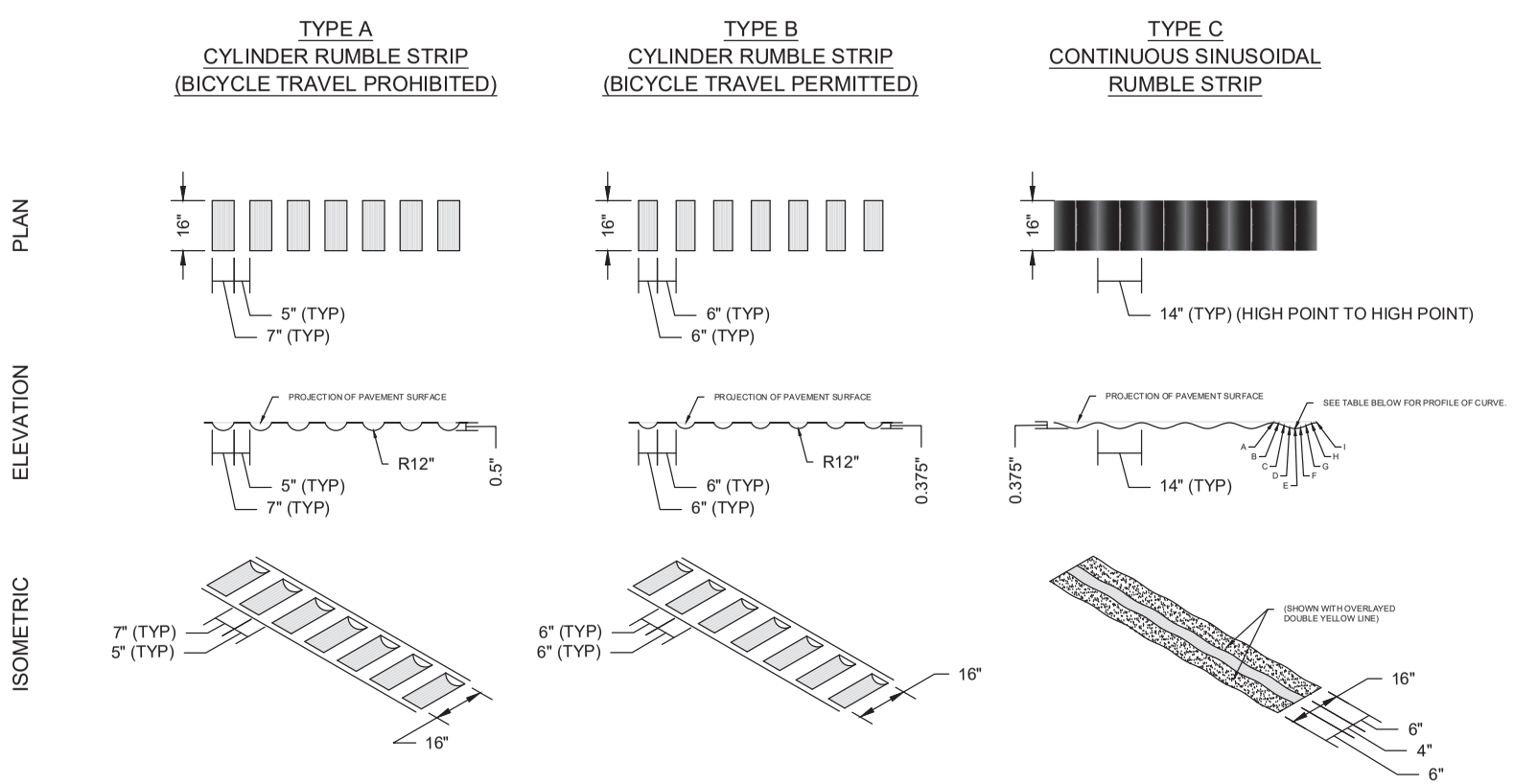
Notes:

	Separate logs shall be kept to track areas or plants with different watering schedules. Trees shall receive a minimum of 10 gallons with each watering and shrubs a minimum of 5 gallons. Provide note that if watering is not performed as scheduled due to rain. Record date of rainfall and amount.												
Date Watered													
Landscape Contractor Initial													
Prime Contractor Initial													
Date Watered													
Landscape Contractor Initial													
Prime Contractor Initial													

Each week, following watering, Log shall be submitted to the MassDOT Engineer.
6/15/2018

DOCUMENT A00816

RUMBLE STRIP DETAILS



NOTES:

1. NOT TO SCALE. SOME LINE WORK EXAGGERATED FOR CLARITY.
2. SEE PLANS FOR LOCATION(S) AND START AND END STATIONS FOR ALL RUMBLE STRIP INSTALLATIONS.
3. HIGH POINT OF SINUSOIDAL RUMBLE STRIP LOCATED $\frac{1}{16}$" BELOW PAVEMENT SURFACE.

DESIGN OF CURVE PROFILE FOR SINUSOIDAL RUMBLE STRIP									
POINT	A	B	C	D	E	F	G	H	I
DEPTH FROM PAVEMENT SURFACE (IN.)	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{7}{32}$	$\frac{11}{32}$	$\frac{3}{8}$	$\frac{11}{32}$	$\frac{7}{32}$	$\frac{1}{8}$	$\frac{1}{16}$
DISTANCE FROM HIGH POINT "A" (IN.)	0	1.75	3.5	5.25	7	8.75	10.5	12.25	14

massDOT Massachusetts Department of Transportation Highway Division

TRAFFIC & SAFETY STANDARDS
SECTION 860

RUMBLE STRIP DETAILS

D-TE OF ISSUE
2020

DR- ING NUMBER
XXX.X.X

DOCUMENT A00820

Massachusetts Department of Transportation
Conditions of Custody

REQUEST FOR RELEASE OF MASSDOT AUTOCAD FILES FORM
(Only to be used following award of contract)

City/Town: MENDON Project File Number: 608491

Contract Number: 131468

Project Description: Resurfacing and Related Work on Route 16

All AutoCAD files are provided solely as a courtesy to facilitate public access to information. MassDOT attempts to provide current and accurate information but cannot guarantee so. MassDOT provides such documents, files or other data "as is" without any warranty of any kind, either expressed or implied, including but not limited to, accuracy, reliability, omissions, completeness and currentness. The Commonwealth of Massachusetts and its Consultants shall not be liable for any claim for damages, including lost profits or other consequential, exemplary, incidental, indirect or special damages, relating in any way to the documents, files or other data accessible from this file, including, but not limited to, claims arising out of or related to electronic access or transmission of data or viruses. Because data stored on electronic media can deteriorate undetected or be modified without our knowledge, MassDOT cannot be held liable for its completeness or correctness. MassDOT makes no representation as to the compatibility of these files beyond the version of the stated CAD software.

By signing this form, I agree that it shall be my responsibility to reconcile this electronic data with the conformed contract documents, and that only the conformed contract documents shall be regarded as legal documents for this Project. I understand that this authorization does not give me the right to distribute the files. I agree to the terms above and wish to receive the AutoCAD files.

This signed form shall be emailed to the Highway Design Engineer at the MassDOT -Highway Division at the following email address:

DOTHighwayDesign@dot.state.ma.us
Attn: AutoCAD Files

Name of person requesting AutoCAD files: _____

Affiliation/Company: _____

Address: _____

_____

Telephone number: _____

Email address: _____

Signature/Date: _____

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DOCUMENT A00830

ARMY CORPS OF ENGINEERS

Permit Application

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HNTB Corporation
The HNTB Companies
Engineers Architects Planners

31 St James Ave Ste. 300
Boston, MA 02116

Telephone (617) 542-6900
Facsimile (617) 428-6905
www.hntb.com

December 18, 2024

Dan Vasconcelos
U.S. Army Corps of Engineers – Regulatory Division
696 Virginia Road
Concord, MA 01742

Re: Section 404 Pre-Construction Notification
Resurfacing and Related Work on Route 16
Mendon, MA

Dear Mr. Vasconcelos,

On behalf of the Massachusetts Department of Transportation (MassDOT) - Highway Division, HNTB is submitting the enclosed Pre-Construction Notification (PCN) for resurfacing and related work on Route 16 (Project) in Mendon, Massachusetts. The project corridor begins on Uxbridge Road (Route 16) just west of Taft Avenue in Mendon and extends 2.02 miles to the Hopedale Town line. The purpose of the project is to improve safety, operations, and connectivity for all users of the project corridor, consistent with MassDOT's Healthy Transportation Directive (P-13-0001).

Proposed improvements include:

- Micro-milling and hot mix asphalt overlay of the roadway along Route 16. The roadway will be widened where necessary to provide for the needed lane and shoulder widths through the corridor.
- Construction of a shared use path along the eastbound direction of Route 16 to provide pedestrian and bicycle accommodations throughout the Route 16 corridor.
- Sidewalk reconstruction along the westbound direction of Route 16.
- Updates to pedestrian crossings and signal equipment at several intersections along the project corridor. Pavement markings and signage will be upgraded throughout the project limits.
- Drainage system upgrades and utility pole relocations as required.
- Updates to existing culverts, including headwall replacement and extension.

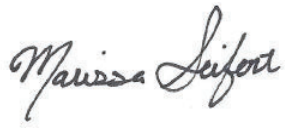
The project requires authorization from the U.S. Army Corps of Engineers through Pre-Construction Notification (PCN) under General Permit 23 (Linear Transportation Projects and Wetland/Stream Crossings) of the 2023 General Permits for Massachusetts as it will result in approximately 76 linear feet of cumulative impacts to the limit of the Ordinary High-Water Mark (OHWM) and 169 square feet of cumulative impacts to Waters of the United States (WOTUS).

The project proponent hereby certifies that all information contained herein is true, accurate, and complete to the best of my knowledge and belief.

The project proponent hereby requests that the certifying authority review and take action on this PCN within the applicable reasonable period of time. If you have any questions, please do not hesitate to contact me at (617)-981-0653 or via e-mail at mseifert@hntb.com or Erica Larner at (857)-268-1729 or

via e-mail at erica.n.larner@dot.state.ma.us

Sincerely,



Marissa Seifert, PWS
Section Manager - Environmental Assessment

Enclosed: ACOE Pre-Construction Notification Application Package

Cc: Mendon Conservation Commission
Kimberly Sloan, MassDOT
Melissa Lenker, MassDOT
Erica Larner, MassDOT
Kevin Thompson, MassDOT
James Barnack, HNTB

Resurfacing and Related Work on Route 16 (Uxbridge Road)

Mendon, MA
MassDOT Project #608491

PRE-CONSTRUCTION NOTIFICATION

December 2024

PREPARED FOR:

Massachusetts Department of Transportation – Highway Division
10 Park Plaza
Boston, Massachusetts 02116

Phone: (857) 268 - 1729
Contact: Erica Larner

PREPARED BY:

HNTB Corporation
31 Saint James Avenue
Boston, Massachusetts 02116

Phone: (617) 981 - 0653
Contact: Marissa Seifert

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Part A: USACE Pre-Construction Notification Form

U.S. Army Corps of Engineers (USACE), New England District (NAE)

PRE-CONSTRUCTION NOTIFICATION (PCN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose The information provided will be used in evaluating activities under Pre-Construction Notification procedures within New England.

Routine Uses This information may be shared with other federal, state, and local government agencies during the application review process. Submission

Disclosure of requested information is voluntary. However, if information is not provided the PCN application cannot be fully evaluated nor can USACE render a permit decision.

Instructions The applicant must complete ALL required sections of this document before their submission to USACE. The PCN submission to USACE shall include one set of drawings which show the location and character of the proposed activity, statements that address each required field below, and documentation that supports each field (e.g., emails, letters, description/narrative, phone calls, surveys, reports, etc.). Electronic submissions to the following address are strongly preferred: cenae-r-ma@usace.army.mil. The email subject line shall contain the following: General Permit #, PCN, City/Town, and date submitted. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME

First - Erica Middle - N Last - Larner

Company - MassDOT - Highway Division

E-mail Address - erica.n.larner@dot.state.ma.us

8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)

First - Marissa Middle - J. Last - Seifert

Company - HNTB Corporation

E-mail Address - mseifert@hntb.com

6. APPLICANT'S ADDRESS:

Address- 10 Park Plaza, Room 7360

City - Boston State - MA Zip - 02116 Country - USA

9. AGENT'S ADDRESS:

Address- 31 Saint James Avenue, Suite 300

City - Boston State - MA Zip - 0211 Country - USA

7. APPLICANT'S PHONE NOs. with AREA CODE

a. Residence b. Business c. Fax d. Mobile

8572681729

10. AGENT'S PHONE NOs. with AREA CODE

a. Residence b. Business c. Fax d. Mobile

8579738753

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Marissa Seifert to act on my behalf as my agent in the processing of this general permit PCN application and to furnish, upon request, supplemental information in support of this general permit PCN application.

Erica N. Larner Digitally signed by Erica N. Larner Date: 2024.12.18 16:31:11 -05'00'

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)

Resurfacing and Related Work on Route 16 (Uxbridge Road)

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)

Muddy Brook, unnamed intermittent stream

14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)

Route 16 (Uxbridge Road)

City: Mendon State: MA Zip: 01756

15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)

Latitude: 42.103320 °N Longitude: -71.562221 °W

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: N/A - SHLO Municipality: Mendon

Section: N/A Township: N/A Range: N/A

17. DIRECTIONS TO THE SITE.

The Site is located along Uxbridge Road (Route 16) in Mendon. From Boston, take I-90 W to Exit 106 and merge onto I-495 S. From I-495 S, take Exit 50 to merge onto MA-85 S toward Milford/Hopkinton. From MA-85 S, turn right onto Dilla Street. After 1.0 miles, turn left onto Purchase Street. In 0.7 miles, take a slight right onto School Street and continue onto Route 16. In approximately 2.5 miles, the Site will be on the right.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

Massachusetts General Permit (GP) #23 - Linear Transportation Projects and Wetland/Stream Crossings

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

MassDOT is proposing to reconstruct and resurface Route 16 in Mendon, Massachusetts (Site). The Site consists of 1.9 miles of Route 16 between Taft Avenue and the Hopedale Town Line, as shown on the USGS Project Location Map (Figure 1) in Appendix A. Work will include pavement repair and resurfacing, bicycle and pedestrian accommodations including a shared-use path, and reconstruction of the signalized intersections to include new traffic signal equipment and address issues from previous road safety audits. The Project will result in temporary and permanent impacts to Bank associated with Muddy Brook and the unnamed stream adjacent to HNTB-G, respectively. Permanent impacts to Bank are due to the extension of the culvert at the unnamed stream to accommodate the proposed shared-use path. These roadway improvements will result in a wider road cross section, which will require the existing culvert to be extended by approximately 8' on the upstream end. The Project will also include temporary impacts to WOTUS due to dewatering activities at Muddy Brook including the installation of cofferdams, a 42" ductile iron (DI) bypass pipe, a temporary concrete scour pad, and a dewatering pump. There are no permanent impacts to WOTUS proposed as part of the Project.

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

The purpose of the Project is to improve safety, operations and connectivity for all users, consistent with MassDOT's Healthy Transportation Directive (P-13-0001). Specifically, the Project will enhance safety and connectivity by closing gaps in the sidewalk network and improve bicycle accommodations by providing a shared-use path, encourage safe vehicle speeds by updating intersection geometrics to MassDOT standards at all intersections throughout the Site, improve pavement conditions and rideability of Route 16, and improve and update existing utility infrastructure throughout the Site.

22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by Proposed General Permit Activity (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration	Purpose
96 (temp), 73 (perm)	-		49 days	Temporary impacts to WOTUS are due to dewatering activities at Muddy Brook and the unnamed tributary including the installation of cofferdams, a 42" ductile iron (DI) bypass pipe, dewatering pump, and a culvert extension at an un-named tributary
-	35 (temp), 41 (perm) (limit of OHWM)		25 days	Permanent impacts to Bank are due to the extension of the culvert at the unnamed intermittent stream to accommodate the proposed shared-use path. Temporary impacts to Bank are due to dewatering activities at Muddy Brook.

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site.

23. List any other GP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project on any related activity (*see instructions*)

Order of Conditions - Mendon Conservation Commission

National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) - Environmental Protection Agency (EPA)

24. If the proposed activity will result in the loss of aquatic resources that exceed those identified in the New England District Compensatory Mitigation Thresholds, explain how the compensatory mitigation requirement will be satisfied. (*see instructions*)

N/A - The Project will not result in the loss of aquatic resources that exceed those identified in the New England District Compensatory Mitigation Thresholds.

25. Is Any Portion of the General Permit Activity Already Complete? [ ] Yes [X] No If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. (*see instructions*)

According to a December 2023 search of the IPAC, the federally endangered northern long-eared bat (NLEB) (Myotis septentrionalis) is potentially present within the project corridor. The project received a Not Likely to Adversely Affect (NLAA) Concurrence Letter from the USFWS for NLEB via the FHWA PBO (refer to Appendix E). According to a subsequent search of the IPaC database conducted in August 2024, NLEB are no longer likely to be present within the project corridor. The IPaC identified the potential presence of Tricolored bat (TCB).

27. List any historic properties that have the potential to be affected by the proposed GP activity or include a vicinity map indicating the location of the historic property or properties. Attach relevant project information, along with any responses received from project notifications to this submittal. (*see instructions*)

As part of the Project, one historic property is proposed to be relocated (Wood's Civil War Memorial), and a portion of the Project is within the Mendon Center Local Historic District. However, there are no properties or areas within the waterway resource areas impacted by the Project. MassDOT has been in communication with the Massachusetts Historical Commission and the Mendon Historical Commission throughout design of the Project, and will continue coordination in order to complete construction in a manner that protects these resources.

28. For a proposed GP activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, identify the Wild and Scenic River or the "study river":

N/A - The Project will not impact federal lands, wetlands, or waterbodies associated with or designated as a National Wild and Scenic River.

29. If the proposed GP activity also requires permission from the USACE pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, have you submitted a written request for section 408 permission from the USACE district having jurisdiction over that project? [ ] Yes [ ] No

If "yes", please provide the date your request was submitted to the USACE District:

30. Does the activity require a 401 Water Quality Certification (WQC)? If so, specify the type of 401 WQC that is required (general or individual). In cases where an individual 401 WQC is required, provide the date the 401 WQC certification request was submitted to the certifying authority and their contact information.

Pursuant to 314 CMR 9.03(1), activities conducted in compliance with the Wetlands Protection Act where alteration is <5,000 sf and the Project receives an Order of Conditions, no 401 Water Quality Certification is required. Therefore, the Project does not require a 401 Water Quality Certification.

31. If the terms of the GP(s) you want to use require additional information to be included in the PCN (i.e. sampling and analysis plan), please include that information in this space or provide it on an additional sheet of paper marked Block 30. (*see instructions*)

N/A

32. I certify that the information in this pre-construction notification is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Erica N. Larner Digitally signed by Erica N. Larner
Date: 2024.12.18 16:31:27 -05'00'

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The Pre-Construction Notification must be signed by the person who desires to undertake the proposed activity (applicant) and, if the statement in block 11 has been filled out and signed, the authorized agent.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a

Department of the Army

General Permit (GP) Pre-Construction Notification (PCN)

Blocks 1 through 4. To be completed by the U.S. Army Corps of Engineers.

Block 5. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the PCN, please attach a sheet of paper with the necessary information marked Block 5.

Block 6. Address of Applicant. Please provide the full address of the party or parties responsible for the PCN. If more space is needed, attach an extra sheet of paper marked Block 6.

Block 7. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed, if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 9 and 10. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by the applicant, if an agent is to be employed.

Block 12. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 13. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Activity Street Address. If the proposed GP activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. Location of Proposed Activity. Enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area requiring evaluation. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 15.

Block 16. Other Location Descriptions. If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality where the site is located.

Block 17. Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide a description of the location of the proposed GP activity, such as lot numbers, tract numbers, or you may choose to locate the proposed GP activity site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed GP activity site if known. If there are multiple locations, please indicate directions to each location on a separate sheet of paper and mark as Block 17.

Block 18. Identify the Specific General Permit(s) You Propose to Use. List the number(s) of the General Permit(s) you want to use to authorize the proposed activity (e.g., GP 4).

Block 19. Description of the Proposed General Permit Activity. Describe the proposed GP activity, including the direct and indirect adverse environmental effects of the proposed activity. The description of the proposed activity should be sufficiently detailed for USACE to determine that the adverse environmental effects of the activity will be no more than minimal. Identify the materials to be used in construction, as well as the methods by which the work is to be done.

Provide drawings to show that the proposed GP activity complies with the terms of the applicable GP(s). Drawings should contain sufficient detail to provide an illustrative description of the proposed GP activity, but do not need to be detailed engineering plans. The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 19.

Block 20: Description of Proposed Mitigation Measures. Describe any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed GP activity. The description of any proposed mitigation measures should be sufficiently detailed for USACE to determine how the measures would avoid and minimize adverse environmental effects. If adverse effects exceed the New England District compensatory mitigation thresholds, you must document how compensatory mitigation would be satisfied in Block 24.

Block 21. Purpose of General Permit Activity. Describe the purpose and need for the proposed GP activity. What will it be used for and why? Also include a brief description of any related activities associated with the proposed project. Provide the approximate dates you plan to begin and complete all work.

Block 22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by the Proposed General Permit Activity. For discharges of dredged or fill material into Waters of the U.S., provide the amount of wetlands, streams, or other types of waters filled, flooded, excavated, or drained by the proposed GP activity. For structures or work in Navigable Waters of the U.S. subject to Section 10 of the Rivers and Harbors Act of 1899, provide the amount of navigable waters filled, dredged, occupied by one or more structures (e.g., aids to navigation, mooring buoys) by the proposed GP activity. The area of impact includes the structures or fills with direct or indirect effects to waters of the U.S. The length of impact includes the length of a stream, including is banks, that are directly affected by the structures or fills. The duration of impact should be identified as temporary (xx days) or permanent. The impact purpose should briefly describe what structure or fill is responsible for the impact.

Block 23. Identify Any Other General Permit(s), Regional General Permit(s), or Individual Permit(s) Used to Authorize Any Part of Proposed Activity or Any Related Activity. List any other GP(s) or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. For linear projects, list other separate and distant crossings of waters and wetlands authorized by these GPs that do not require PCNs. If more space is needed, attach an extra sheet of paper marked Block 23.

Block 24. Compensatory Mitigation Statement for Losses Greater Than the New England District Compensatory Mitigation Thresholds. New England District requires compensatory mitigation at a minimum one for one replacement ratio or greater for all aquatic resource losses that require a PCN and exceed the New England District Compensatory Mitigation Thresholds, unless USACE determines in writing that either some other form of mitigation is more environmentally appropriate or the adverse environmental effects of the proposed GP activity are no more than minimal without compensatory mitigation, and provides an activity specific waiver of this requirement. Describe the proposed compensatory mitigation for wetland losses greater than the New England District Compensatory Mitigation Thresholds or provide an explanation of why USACE should not require wetland compensatory mitigation for the proposed GP activity. If more space is needed, attach an extra sheet of paper marked Block 24.

Block 25. Is Any Portion of the General Permit Activity Already Complete? Describe any work that has already been completed for the GP activity.

Block 26. List the Name(s) of Any Species Listed As Endangered or Threatened under the Endangered Species Act that Might be Affected by the General Permit Activity. If you are not a federal agency, and if any listed species or designated critical habitat might be affected or is in the vicinity of the proposed GP activity, or if the proposed GP activity is located in designated critical habitat, list the name(s) of those endangered or threatened species that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 7 of the Endangered Species Act.

Block 27. List Any Historic Properties that Have the Potential to be Affected by the General Permit Activity. If you are not a federal agency, and if any historic properties have the potential to be affected by the proposed GP activity, list the name(s) of those historic properties that have the potential to be affected by the proposed GP activity. Provide all relevant documentation about these historic properties in the PCN submittal. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

Block 28. List the Wild and Scenic River or Congressionally Designated Study River if the General Permit Activity Would Occur in such a River. If the proposed GP activity will occur in a river in the National Wild and Scenic River System or in a river officially designated by Congress as a "study river" under the Wild and Scenic Rivers Act, provide the name of the river. For a list of Wild and Scenic Rivers and study rivers, please visit http://www.rivers.gov/

Block 29. General Permit Activities that also Require Permission from the USACE Under 33 U.S.C. 408. If the proposed GP activity also requires permission from the USACE under 33 U.S.C. 408 because it will temporarily or permanently alter, occupy, or use a USACE federal authorized civil works project, indicate whether you have submitted a written request for section 408 permission from the USACE district having jurisdiction over that project.

Block 30. 401 Water Quality Certification. As described above, specify if the activity requires a 401 WQC from the certifying authority.

Block 31. Other Information Required For General Permit Pre Construction Notifications. The terms of some of the General Permits include additional information requirements for preconstruction notifications:

* Maintenance – information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals.
* Temporary Construction, Access, and Dewatering – a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions.
* Repair of Uplands Damaged by Discrete Events – documentation, such as a recent topographic survey or photographs, to justify the extent of the proposed restoration.
* Commercial Shellfish Aquaculture Activities – (1) a map showing the boundaries of the project area, with latitude and longitude coordinates for each corner of the project area; (2) the name(s) of the species that will be cultivated during the period this GP is in effect; (3) whether canopy predator nets will be used; (4) whether suspended cultivation techniques will be used; and (5) general water depths in the project area (a detailed survey is not required).Dredging – (1) a proposed sampling and analysis plan shall be provided to USACE for approval prior to its execution. Pre-application meetings are encouraged.
* Beach Nourishment – sediment grain size should be determined for the length of the beach where nourishment is proposed. The frequency and locations of sediment sampling shall be sufficient to identify the sediment composition of the beach profile. This data shall be consolidated to generate a sediment gradation curve for each sampled transect. Each sampled transect should also be identified on the project plans (drawings).

If more space is needed, attach an extra sheet of paper marked Box 31.

Block 32. Signature of Applicant or Agent. The PCN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the PCN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the PCN possesses the requisite property rights to undertake the GP activity (including compliance with special conditions, mitigation, etc.).

DELINEATION OF WETLANDS, OTHER SPECIAL AQUATIC SITES, AND OTHER WATERS

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by the USACE. The permittee may ask the USACE to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the USACE does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. The 60-day PCN review period will not start until a delineation has been completed.

DRAWINGS AND ILLUSTRATIONS

General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross Section Map. Identify each illustration with a figure or attachment number. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings should also be included. Please submit one copy of all drawings on 8½ x 11 inch plain white paper (electronic submissions preferred). Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.

ADDITIONAL INFORMATION AND REQUIREMENTS

For proposed GP activities that involve discharges into waters of the United States, water quality certification from the State, Tribe, or EPA must be obtained or waived. Some States, Tribes, or EPA have issued water quality certification for one or more GPs. Please check the New England District website to see if water quality certification has already been issued for the GP(s) you wish to use. For proposed GP activities in coastal states, state Coastal Zone Management Act consistency concurrence must be obtained, or a presumption of concurrence must occur. Some States have issued Coastal Zone Management Act consistency concurrences for one or more GPs. Please check the New England District website to see if Coastal Zone Management Act consistency concurrence has already been issued for the GP(s) you wish to use.

Part B: USACE PCN Narrative

1. Introduction

In accordance with Section 404 of the Clean Water Act (CWA), the Massachusetts Department of Transportation – Highway Division (MassDOT) is submitting this application for a U.S. Army Corps of Engineers (USACE) Pre-Construction Notification (PCN) under Massachusetts General Permit (GP) #23 – Linear Transportation Projects and Wetland/Stream Crossings. MassDOT is requesting authorization to perform work in jurisdictional Waters of the United States (WOTUS) along Route 16 (Uxbridge Road) in Mendon, Massachusetts. The purpose of the project is to improve safety, operations, and connectivity for all users, consistent with MassDOT's Healthy Transportation Directive (P-13-0001).

The project corridor consists of 2.02 miles of Route 16 between Taft Avenue and the Hopedale Town Line, as shown on the United States Geological Survey (USGS) Topographic Map (Figure 1) in Appendix A. The following intersections and their roadway approaches constitute the project corridor:

- Route 16 and Hartford Avenue West
- Route 16 and Millville Street
- Route 16 and Emerson Street / Washington Street
- Route 16 and Maple Street
- Route 16 and Main Street / North Avenue

Work will include pavement repair and resurfacing, provision of bicycle and pedestrian accommodations, including a shared-use path, reconstruction of the signalized intersections to include new traffic signal equipment, and address issues from previous road safety audits. Additionally, the project includes drainage improvements along the corridor, vegetation clearing to improve sight distances, and work on two existing culverts to accommodate the widening necessary for the shared-use path.

The project will result in 96 square feet (sf) of permanent and 73 sf of temporary impacts to WOTUS, and 35 linear feet (lf) of temporary impacts and 41 lf of permanent impacts to the limit of Ordinary High Water Mark (OHWM) associated with the Muddy Brook River and an unnamed intermittent stream. During construction, erosion and sedimentation controls such as silt fencing and compost filter tubes (or similar) will be utilized. All erosion and sedimentation controls will be removed following completion of the work, and all disturbed areas will be permanently stabilized. Sections 4 and 5, respectively, include a detailed discussion of the project impacts and mitigation.

In addition to filing this PCN, the project will require the following permits and regulatory approvals: an Order of Conditions from the Mendon Conservation Commission; Massachusetts Endangered Species Act (MESA) Review; National Environmental Policy Act (NEPA) Compliance; Section 7 of the U.S. Endangered Species Act consultation; and Section 106 of the National Historic Preservation Act consultation.

2. Existing Conditions

The project begins at Route 16 in Mendon just west of Taft Avenue and continues east for 2.02 miles on Route 16 to the Hopedale Town Line before terminating just east of Harrington Street (Figure 2). The

following subsections detail the existing project corridor conditions, the results of a desktop review, and the results of a field delineation.

2.1 Existing Roadway Conditions

Route 16, also known within Mendon as Uxbridge Road or Milford Street, is an east-west state highway in Massachusetts, spanning Worcester, Middlesex, Norfolk, and Suffolk Counties. Within the Site, Route 16 generally runs east-west with one lane in each direction. Parking is prohibited on both sides of the roadway along the Site. The section of Route 16 in Mendon within the Site has a posted speed limit of 45 miles per hour (mph) from the Uxbridge Town line to Maple Street and drops to 35 mph between Maple Street and North Avenue/Main Street. The posted speed limit east of North Avenue to Granite Street is 50 mph. The speed limit between Granite Street and the Hopedale town line is 40 mph.

Currently, there is no bicycle accommodation on Route 16. Route 16 also has several substandard design features, including insufficient stopping sight and decision sight distance, instability in the asphalt pavement, and current geometrics of the roadway, which have led to excessive vehicle speeds. There is a mix of commercial, residential, industrial, and recreational properties directly abutting the project corridor.

2.2 Existing Drainage Conditions

There are eight existing drainage areas that discharge to existing outfalls located at low points along the Route 16 project corridor. Stormwater run-off is captured by a series of catch basins along the gutter line of the road and conveyed through a network of closed pipes.

The Muddy Brook Culvert is an existing 6′ x 6′ concrete box culvert that conveys Muddy Brook under Route 16. The culvert length is 61 feet, with an upstream invert of 259.89 and a downstream invert of 259.20. The slope of the culvert is 1.13%. A site visit was conducted by HNTB on August 10, 2020, in which the culvert was photographed. The culvert barrel appeared to be in good condition. Minor spalling, cracking, and chipping were observed on the upstream headwall. The downstream headwall appeared to be in good condition. The Rt. 16 culvert over an unnamed stream (STA. 224-225) is a 30″ reinforced concrete pipe (RCP).

2.3 Existing Environmental Conditions

2.3.1 Desktop Assessment

According to the United States Geological Survey (USGS) topographic map, the approximate range of elevation for the Site is from 273 to 445 feet above mean sea level (Figure 1). Most of the area impacted by the Project consists of the previously cleared and maintained Route 16 right-of-way. The remaining portions of the Project are a mixed use of residential, commercial, and industrial properties.

Based on reviews of the MassDEP Wetland Area Maps for Worcester County[1], the Site is mapped as having the following inland resources: Shallow Marsh Meadow or Fen, Wooded Swamp Deciduous, and Wooded Swamp Mixed Trees (Figure 3).

[1] MassDEP. 2020. Mass DEP Online Map Viewer Wetland and Wetland Change Areas Map. Available at: http://maps.massgis.state.ma.us/images/dep/omv/wetviewer.htm. Accessed November 2022.

Based on a review of the National Wetland Inventory (NWI) Map provided by the U.S. Fish and Wildlife Service (USFWS), inland wetlands are mapped within and surrounding the Site and have similar boundaries as the inland resources mapped by MassDEP (Figure 4). The wetlands mapped within the Site are classified as palustrine forested, broad-leaved deciduous, seasonally flooded/saturated (PFO1E), palustrine emergent, persistent, seasonally flooded/saturated (PEM1E), riverine, intermittent, streambed, seasonally flooded (R4SBC), and riverine, perennial, unconsolidated bottom, permanently flooded (R5UBH).

The most recently issued Flood Insurance Rate Map[2] produced by the Federal Emergency Management Agency (FEMA), indicates that portions of the Site in the vicinity of Muddy Brook are mapped as Zone AE, which is characterized as having a 1% annual chance of a flood hazard (also known as the 100-year floodplain) and Regulatory Floodway, which is classified as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height (Figure 5). The base flood elevation upstream of the culvert under Route 16 is 267.0 feet above mean sea level, and the base flood elevation downstream of the culvert under Route 16 is 265.5 feet above mean sea level. According to USGS StreamStats data, the bankfull width of Muddy Brook River is approximately 17.8 feet, and the approximate bankfull width of the unnamed stream is 3.4 feet.

The U.S. Department of Agriculture Natural Resources Conservation Service[3] (USDA – NRCS) soil survey for Worcester County has mapped most of the Project as Scituate fine sandy loam, 3 to 8 percent slopes (315B). For a full listing of the hydric soils within and surrounding the Site, refer to Figure 6.

According to the most recently available data provided by the Massachusetts Natural Heritage and Endangered Species Program[4], a small portion of the Project falls within an Estimated Habitat of Rare Wildlife area (EH 673) and Priority Habitat of Rare Species area (PH 858) (**Figure 7**). There are no Certified or Potential Vernal Pools within or adjacent to the Site. The closest Certified Vernal Pool (CVP 8232) is located approximately 1,800 feet west, and the closest Potential Vernal Pool (PVP 14011) is located approximately 200 feet west. Muddy Brook is a designated coldwater fishery (SARIS ID #5131300).

The Project is not located within an Area of Critical Environmental Concern[5] or Outstanding Resource Water[6]. The Project is located within several Zone I, Zone II, or Interim Wellhead Protection Areas[7].

Three open space parcels directly abut the project corridor (Figure 8). The Mendon Driving Range, which is privately owned, is located approximately 850 feet south of the Route 16/Washington Street intersection. Founders' Park, owned by the Town of Mendon, is located directly adjacent to the Route 16/North Avenue intersection. Muddy Brook North Conservation Area, also owned by the Town of Mendon, runs parallel along Route 16 from just north of the Route 16/North Avenue intersection to the Mendon Twin Drive-In Theater.

[2] Federal Emergency Management Agency, October 2017, National Hazard Flood Layer, Digital Flood Insurance Rate Map. Map 25027C1031E. Effective 7/4/2011. Accessed November 1, 2022.
[3] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey
[4] Massachusetts Natural Heritage and Endangered Species Program, Oct. 2017. Massachusetts Natural Heritage Atlas. 14th Edition.
[5] MassGIS (collaboration with DCR and CZM), Sept. 2017. Massachusetts ACECs.
[6] MassGIS, Dec. 2017. Designated Outstanding Resource Waters of Massachusetts.
[7] MassGIS, Oct. 2017. Approved Wellhead Protection Areas (Zone I and IWPAs).

2.3.2 Field Delineation of Wetlands and Waters of the United States

A field delineation was conducted on August 7th in accordance with methods developed by USACE[8,9]. A second field verification was performed on October 4th, as the original delineation is greater than three (3) years old. The affidavit signed by an HNTB wetland scientist detailing the changes to the original resource lines is included in Appendix B**.** Wetland resources identified within or near the project corridor include Vegetated Wetlands (VW), Perennial Stream, Intermittent Stream, Bank, and Floodplain.

Wetland resource areas within the project corridor are summarized in the table below and depicted on the Site Plans in Appendix C. Refer to the Wetland Delineation Report and Wetland Delineation Affidavit in Appendix B for details on each delineated wetland area, including written descriptions, photographs, and field data forms.

Table 1. Summary of Waters and Wetlands within Project Corridor

Wetland Series	USACE Regulated Features				
	Vegetated Wetland	Perennial Stream	Intermittent Stream	Bank	Floodplain
HNTB-A	X				
HNTB-B	X				
HNTB-C	X				
HNTB-D	X				
HNTB-E	X				
HNTB-F	X				
HNTB-G	X				
HNTB-H	X				
HNTB-I	X				
HNTB-J	X				
Muddy Brook		X		X	X
Willow Brook			X	X	
Unnamed Intermittent Stream			X	X	

3. Proposed Conditions

3.1 Proposed Project

The project proposes an 11-foot travel lane in each direction with a 2-foot shoulder in the eastbound direction and a 5-foot shoulder in the westbound direction. From Hartford Avenue West until the Washington Street/Emerson Street intersection, a two-way left turn lane is proposed. The design will also include an 8-foot shared-use path with a 4-foot grass buffer in the eastbound direction for the length of the Project and a 7-foot sidewalk in the westbound direction from Hartford Avenue West to North Avenue. Most of the Project will consist of a standard mill and overlay with sections of full depth widening in areas where the cross-section is increasing in width.

Both the sidewalk and the shared-use path will be hot-mix asphalt (HMA) pavement. To improve safety

[8] USACE, 1987. Corps of Engineers Wetlands Delineation Manual
[9] USACE, 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0.

and traffic operations, five (5) intersections along the corridor will be reconstructed with geometric improvements (Hartford Avenue West, Millville Street, Emerson Street/Washington Street, Maple Street, and Main Street/North Avenue). Traffic signal improvements are proposed at Hartford Avenue West, Maple Street, and North Avenue/Main Street, and Americans with Disability Act of 1990 (ADA) compliant crossings will be constructed at all roadway crossings where pedestrian facilities are present.

3.1.1 Roadway Resurfacing and Reconstruction

The project proposes the construction of an 8-foot shared-use path along Route 16 within the project corridor, which will require full depth widening. The project also proposes standard mill and overlay along Route 16 and the associated intersections to improve substandard pavement conditions. The mill and overlay portion of the project involves grinding off the top layer of existing asphalt pavement using a large milling machine and replacing this layer with a new HMA riding surface. The typical milling depth is between 1" and 2", depending on the condition of the existing riding surface, the depth of the available curb reveal, and the depth of the existing asphalt pavement.

3.1.2 Drainage Improvements

The project proposes several improvements to the existing drainage system, including deep sump catch basins, a sediment forebay for pre-treatment with an open-graded infiltration basin, and grassed channels with sediment forebays and check dams for collection and treatment of runoff. All runoff will flow into deep sump catch basins or vegetated conveyance channels, which is an improvement to the existing conditions where only standard catch basins currently exist.

Existing pipes and structures were maintained to the maximum extent possible. The physical constraints of the existing drainage system limited the flexibility of the proposed design. Proposed pipes were placed at the lowest elevation possible to maximize cover, meet all corresponding existing downstream inverts, and adhere to the MassDOT standards.

3.1.3 Culvert Work at Muddy Brook

The project proposes an 8-foot shared-use path and a 4-foot grass buffer strip along the roadway above Muddy Brook. No changes are proposed to the existing culvert's size, capacity, or slope, so the work is not anticipated to have any significant changes to the flow regime on either the upstream or downstream side. No work is being proposed on the downstream side, and work on the upstream side is limited to the removal of the existing headwall and installation of concrete retaining walls on either side of the culvert's inlet in its place. The bank and receiving areas are generally stabilized, and no evidence of erosion in the current condition was observed during the site investigation.

It is anticipated that removal of the existing headwall and installation of the concrete retaining walls will require dewatering. The Contractor will be responsible for determining the extent of dewatering required and proposing the most appropriate methods and materials. Prior to working in the stream bed, the Contractor will submit plans to MassDOT for approval. These plans shall depict the proposed materials and methods of controlling flow and water within the work area. This includes cofferdams, flow diversion, and dewatering systems. These plans shall be in conformance with the contract plans and specifications. All dewatering and/or pump-around related earthwork will be conducted in such a manner as to prevent potential siltation and contamination of the waterways. Water from the work area will be pumped into a sediment filter bag, which will be placed in an upland area and encircled with compost filter tubes or straw wattles. All filtered sediments will be removed from the project corridor and disposed of off-site.

3.1.4 Culvert Extension at Unnamed Stream

The project proposes an 8-foot shared-use path and a 4-foot grass buffer strip at the unnamed stream adjacent to HNTB-G. These roadway improvements will result in a wider roadway cross section, which will require the existing culvert to be extended by approximately 15-feet on the downstream end. Included in the culvert extension will be a new concrete headwall at the downstream end. No changes are proposed to the culvert size, capacity, or slope, and it is not anticipated to have any significant changes to the flow regime. The Contractor will be responsible for determining the extent of dewatering required and proposing the most appropriate methods and materials. Prior to working in the stream bed, the Contractor will submit plans to MassDOT for approval.

3.2 Anticipated Construction Sequence

The first stage of construction (Phase 1 – Construction Startup) involves the relocation of existing utility poles and overhead wires, tree trimming, and tree removal to enable work and the establishment of erosion and sedimentation controls. Tree trimming and removal will be required along the right-of-way to maintain roadway safety, the visibility of road signs, and sight distances and to enable proposed work.

Phase 2 (Median – One Lane Northbound & One Lane Southbound) involves the installation of traffic controls and detours, roadway excavation within the median, full depth concrete paving, granite curbing, and the installation of new guardrail.

Phases 3 and 4 (Southbound and Northbound Sides, respectively) includes the installation of traffic controls and detours, roadway excavation, full depth concrete paving, granite curbing, loaming, and seeding, micro milling, and the installation of new guardrail. Work on both culverts will occur during Phase 3. Temporary widening of the roadway will be utilized to allow for construction access for construction activities.

The following are assumptions used throughout construction to prepare the staging plans and the construction contract time determination schedule:

- The schedule has been determined based on the contractor having 1,000 feet of work zone setup at any given time. It is assumed the contractor will have two (2) crews working on the linear portion of the corridor.
- It is assumed there will be no night work.
- Bicycle and pedestrian accommodation will be maintained for the duration of construction. In areas of the Route 16 corridor where the contractor cannot provide a dedicated bicycle facility bicycle lane or minimum 4-foot shoulder, a shared travel lane with the appropriate signage will be provided.

Please note that the contractor will determine the exact sequence of construction. Additionally, the location of laydown areas and stockpiles within the roadway right of way will be determined by the contractor. Laydown areas and stockpiles will not be located within a wetland resource.

4. Wetland Impacts

The project will result in temporary and permanent impacts to the limit of OHWM and WOTUS. Impacts to sensitive environmental resource areas are quantified in the table below.

Table 2. Summary of Impacts

USACE Resource Area	Temporary Impacts	Permanent Impacts	Total Impacts
WOTUS	96 ft^2	73 ft^2	169 ft^2
Limit of OHWM	35 linear feet (lf)	41 lf	76 lf

4.1 Waters of the United States

The Project will result in temporary impacts to riverbed/WOTUS associated with the Muddy Brook River. These impacts are due to dewatering activities at Muddy Brook, including the installation of pump. A control of water plan, which further details dewatering methods, can be found on Sheet 34 of the Project Design Plans (Appendix C). There are no permanent impacts to WOTUS proposed as part of the project due to the nature of the installation of concrete retaining walls on either side of the culvert's inlet.

4.2 Limit of OHWM

The project will result in temporary impacts to the limit of OHMW associated with Muddy Brook due to dewatering activities at Muddy Brook, including the installation of cofferdams, a 42" ductile iron (DI) bypass pipe, a temporary concrete scour pad, and a dewatering pump. No permanent impacts to the OHWM associated with Muddy Brook are proposed as part of the project.

4.3 Regulatory Floodway & 100-Year Floodplain

Portions of the Site are located within the 100-year floodplain associated with the Muddy Brook River. The base flood elevation (BFE) on the upstream side of Muddy Brook River is 267.0,' and the BFE on the downstream side of Muddy Brook is 265.5'. As a result of the Project, there will be a net gain of approximately 75 ft^3 of flood storage capacity. The Project will not alter the hydraulic capacity of the culvert. The project will not result in any permanent impacts to the Regulatory Floodway associated with Muddy Brook River.

5. Mitigation

The project was designed to avoid wetland and waterbody impacts to the maximum extent practicable. Where avoiding impacts was not feasible, MassDOT sought to minimize impacts while providing the necessary operational and safety improvements. The project will result in approximately 41 linear feet of permanent impacts to the limit of OHWM. The project will not result in any loss of aquatic resources that exceed the thresholds identified by the New England District Compensatory Mitigation Thresholds. No mitigation is proposed for the permanent impacts associated with the un-named intermittent stream.

During construction, erosion and sedimentation controls such as silt fencing and compost filter tubes (or similar) will be utilized. All erosion and sedimentation controls will be removed following completion of the work, and all disturbed areas will be permanently stabilized. Locations and details of erosion and

sediment controls are shown in Appendix C. The Contractor will be required to provide a Site and project-specific Erosion and Sediment Control Plan, Stormwater Pollution Prevention Plan (SWPPP), and Spill Prevention Control and Clean-Up (SPCC) prior to construction. The Contractor will also inspect the Site and remove any demolition debris or other construction-related materials upon completion.

Following construction, disturbed areas will be stabilized and re-vegetated with loam and seed. The seed mix will depend on the location. A short grassland mix will be utilized adjacent to lawns, sidewalks, and driveways. The proposed sediment forebay for pre-treatment with an open-graded infiltration basin and grassed channels with sediment forebays, as described in Section 3.2.1, will be seeded with a wetland seasonally flooded mix.

6. Stormwater

The proposed stormwater system has been designed to match existing drainage patterns and layout as closely as possible to minimize the impacts to the existing roadway. Existing catch basins, drainage manholes, cross culverts, and outfalls have been utilized to the maximum extent practicable. The project will result in a net increase of approximately 1.53 acres (66,646 ft^2) of impervious area. As a result of this increase, several structural Best Management Practices (BMPs) are being proposed to improve water quality, promote groundwater recharge, and enhance sediment removal within the drainage networks. The BMPs are detailed below in Table 3.

Table 3. Summary of Proposed Structural BMPs

BMP Type	Location	Impervious Catchment Area (ft^2)	Pervious Catchment Area (ft^2)
Infiltration Basin	42.102224, -71.569179	21, 919	14,989
Grass Channel with Sediment Forebays	42.110556, -71.550539	91,854	41,066
Grass Channel with Sediment Forebays	42.101591, -71.569533	1,225	5,430

Appendix D contains the Stormwater Management Report, which further details how the Project will utilize structural and non-structural control measures to manage stormwater in accordance with federal and state requirements.

6.1 Compliance with the Massachusetts Stormwater Management Standards

The Massachusetts Stormwater Management Standards are applicable under the WPA. The proposed reconstruction of the roadway and intersections within the project corridor are classified as 'redevelopment' per Standard 7 of the Massachusetts Stormwater Management Standards and must comply with standards to the maximum extent practicable. Although the proposed addition of pedestrian and bicycle accommodations is considered a 'new development,' compliance with Stormwater Management Standards is required to the maximum extent practicable (MEP) pursuant to 310 CMR 10.05(6)(m)(6), Footpaths, bike paths, and other paths for pedestrian and/or non-motorized vehicle access. Below is a summary of how the Project will comply with the Massachusetts Stormwater Management Standards.

Standard 1: No New Untreated Discharges or Erosion to Wetlands

The proposed design fully meets the requirements of Standard 1, which states that no new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in

wetlands or waters of the Commonwealth. With deep sump catch basins proposed for all proposed inlets, no new untreated discharges are proposed by the Project. The BMPs included in the proposed stormwater management system are designed in accordance with the MassDEP Stormwater Handbook.

Standard 2: Peak Rate Attenuation

The project meets Standard 2 only to the MEP. Standard 2 states that stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. The proposed BMP measures will reduce peak flows during small storm events but will provide only negligible reduction of peak flows during larger storm events. The right-of-way constraints limit the ability to provide any additional detention to fully meet the requirements of the standard. Pipe sizing calculations are included in Appendix D to demonstrate that the design provides a closed drainage network with the capacity to convey the stormwater runoff from the Project.

Standard 3: Stormwater Recharge

The proposed design fully meets the requirements of Standard 3, which states that loss of annual recharge to groundwater shall be eliminated or minimized using infiltration measures including environmentally sensitive project corridor design, low impact development techniques, stormwater BMPs, and good operation and maintenance. At a minimum, the annual recharge from the post-development project corridor shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the MassDEP Stormwater Handbook.

For discharge to the infiltration trench that will overflow to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to 44% is provided via a deep sump catch basin and open graded sediment forebay. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide compliance to the maximum extent practicable for Standards 3 and 6.

The project adds approximately 1.53 acres of impervious surface area. While only a portion of the project is within HSG B soils, the Required Recharge Volume is conservatively assumed to apply for HSG B soils at all infiltration measures within project limits, resulting in a Required Recharge Volume of 1,943 cubic feet. The surface infiltration basin includes a forebay for pretreatment that is sized for 0.1 inch of rainfall over the impervious area that drains to the basin. Static method calculations are included in Appendix D to demonstrate that the surface infiltration basin at BMP 1 and downstream sediment forebay at BMP 1 recharge 2,163 cubic feet of runoff, exceeding the Required Recharge Volume for the project's increase in impervious area. Appendix D also includes Drawdown Calculations to demonstrate that the basins will drain in less than the maximum 72 hours allowed.

Standard 4: Water Quality

The Project meets Standard 4 only to the MEP. Standard 4 states that stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total

Suspended Solids (TSS). This standard is met when:

- Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan (LTPPP), and thereafter are implemented and maintained;
- Structural stormwater BMPs are sized to capture the required water quality volume as determined in accordance with the MassDEP Stormwater Handbook; and
- Pretreatment is provided in accordance with the MassDEP Stormwater Handbook.

The Infiltration and BMP Basin Sizing Calculations are included in Appendix D. Deep sump catch basins, or a gutter inlet connecting to a manhole with a sump, are provided at all locations where a new catch basin is proposed. The portion of the project that drains to the BMPs includes 2.64 acres of impervious area, almost double the 1.53 acres of impervious area added by the project. All BMP areas are designed to provide at least 63% TSS removal, discharging less than the remainder of the project, which uses only deep sump catch basins to remove 25% TSS. Therefore, the weighted average TSS removal is less than 80%.

However, this project improves upon existing conditions by providing more water quality treatment than the current drainage system provides by providing 68% TSS removal for an impervious area larger than the impervious area added by the project. The majority of the treatment trains for BMP areas provide TSS removal in excess of 80%, and a table showing the TSS removal for each BMP treatment train is included in the table below. A LTPP is not included because the design requires no post-construction actions beyond MassDOT's standard maintenance activities.

Table 4. Water Quality Treatment

Catchment	Impervious Area (SF)	Water Quality Treatment (%)
BMP 2 Road	91,854	63%
BMP 1 Road	16,174	94%
BMP 1 Basin Direct Flow	1,544	93%

The downstream basin of BMP 2 (the BMP with the largest contributing drainage area), after conveying through the designed grass channel, ultimately discharges to an existing grassed conveyance ditch that will remain in place beyond the grading limits of BMP 2. While no credit is claimed in the calculation for treatment by the existing swale, conveyance in natural grass channels has additional potential stormwater quality and recharge benefits.

For discharge to the outfall to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to at least 25% is provided via a deep sump catch basins. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for BMP management and recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standards 4 and 6.

All measures designed for infiltration are designed for the 1-inch water quality volume, and all conveyance measures with TSS removal credit are designed for the water quality flow resulting from a 1-inch, 24-hour storm. Calculations demonstrating compliance with the standards in the

MassDEP BMP manual for all measures removing suspended solids from runoff are included in Appendix D.

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

The proposed design fully meets the requirements of Standard 5, which states that for LUHPPLs, source control and pollution prevention shall be implemented in accordance with the MassDEP Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the MEP. None of the land uses within the project limits have higher potential pollutant loads.

Standard 6: Critical Areas

As a Redevelopment Project, the project meets the 44% TSS removal pretreatment requirements of Standard 6 only to the maximum extent practicable, but fully meets the 1-inch water quality volume requirement for all designed infiltration areas. The grassed channel in BMPs 1 and 2 are designed for the appropriate water quality flow draining to each, as well as the other standards outlined in the MassDEP Stormwater Handbook. Standard 6 states that stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas. Portions of the project discharge to a Coldwater Fishery Resource as designated by the Massachusetts Division of Fisheries and Wildlife (Muddy Brook). Given constraints in grading, available ROW, and the goal of minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for specified BMP measures, including pretreatment, infiltration, and TSS removal, could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standard 6.

Standard 7: Redevelopment and Other Projects Subject to the Standards Only to the Maximum Extent Practicable

Standard 7 states that a redevelopment project is required to meet the following Massachusetts Stormwater Management Standards only to the MEP: Standard 2, Standard 3, and the pretreatment and structural BMP requirements of Standards 4, 5, and 6. Existing stormwater discharges would comply with Standard 1 only to the MEP. The proposed redevelopment project would also comply with Standards 2, 3, 4, and 6 to the MEP, as noted with project restraints. All other requirements of the Stormwater Management Standards will be met by the proposed work and improve existing conditions.

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

The Project fully complies with Standard 8, which states that a plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented. The Project will obtain coverage under the Massachusetts National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP). As required under this permit, a SWPPP will be developed and submitted before land disturbance begins. The SWPPP will be developed by the contractor according to the MassDOT's specifications

and will include the following:

- Construction period pollution prevention measures;
- Erosion and sedimentation control plan drawings;
- Detailed drawings and specifications for erosion control BMPs and sizing calculations;
- An operation and maintenance plan for erosion and sedimentation controls;
- An inspection schedule; and
- A maintenance schedule.

Standard 9: Operations & Maintenance Plan

The Project fully meets the requirements of Standard 9, which states that a long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed. A project-specific Post Construction Operation and Maintenance Plan is not included because the design requires no post-construction actions beyond MassDOT's standard maintenance activities.

Standard 10: Prohibition of Illicit Discharges

The Project is designed to fully comply with Standard 10, which states that all illicit discharges to the stormwater management system are prohibited. The Project will be designed to be in full compliance with current standards. Any property owners identified with illicit connections will be contacted by MassDOT and disconnected from the MassDOT system unless the property owner obtains the required permits for the connection. An Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to post-construction BMPs.

7. Alternatives Analysis

MassDOT evaluated several Route 16 corridor design options during the development of the Build Alternative with respect to safety, operations, environmental impacts, and right-of-way acquisition. As described below, the Preferred Alternative was selected as it best met project purpose and need while minimizing impacts to environmental resources and adjacent right-of-way to the maximum extent practicable.

7.1 Alternative 1 (No-Build)

A No-Build Alternative was evaluated to determine how the transportation system would operate if the proposed project were not built, thus serving to compare the effects of the Build Alternative. The No-Build Alternative would not provide any roadway improvements beyond regularly scheduled routine maintenance, such as roadway resurfacing, striping, and signage upgrades. Additionally, safety and operational issues attributed to substandard roadway design elements would persist. The No-Build Alternative is not considered a reasonable alternative as it fails to satisfy the purpose and need of the proposed action.

7.2 Alternative 2 (Buffered Bike Lanes)

Alternative 2 proposes buffered bike lanes on both sides of Route 16. These bike lanes are at the same grade as the travel lanes and are separated from vehicular traffic by a painted buffer. The corridor from Hartford Avenue West to the Hopedale town line would consist of an 11-foot travel lane, a 5-foot bike lane, and a 3-foot buffer in each direction. A 6-foot sidewalk was proposed on both sides of the roadway. Providing buffered bike lanes and pedestrian accommodations on both sides of the road would result in a wider total corridor cross-section with greater impacts to existing wetlands than the current design. Therefore, Alternative 2 was dismissed.

7.3 Alternative 3 (Shared-Use Path, Preferred Alternative)

Alternative 3 includes a shared-use path that provides pedestrians and bicyclists an off-street alternative to move along the corridor. The corridor from Hartford Avenue West to the Hopedale town line will consist of two 11-foot travel lanes with 5-foot shoulders in the westbound direction and 2-foot shoulders in the eastbound direction. An 8-foot shared-use path with a landscaped buffer is proposed along the south side of Route 16. A 7-foot sidewalk is proposed along the north side of the roadway between Hartford Avenue West and North Avenue. The shared-use path option was selected as the preferred alternative because it proposes fewer impacts to jurisdictional resource areas and allows for increased safety benefits from separating the bicycle accommodations from the roadway.

8. Fisheries and Wildlife

A portion of the project corridor (approximately 0.75 acres, 32,872.5 ft^2) is located within the Massachusetts Natural Heritage and Endangered Species Program Estimated Habitat of Rare Wildlife area (EH 673) and Priority Habitat of Rare Species area (PH 858) associated with Muddy Brook. The project will not result in any adverse effects to habitat, as the project's area of disturbance is associated with disturbed and degraded right-of-way. As described in Section 7.0, there are no practicable or substantially equivalent alternatives for the Project, and the proposed activities improve existing conditions.

According to a December 2023 search of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) database, the federally endangered northern long-eared bat (NLEB) (*Myotis septentrionalis*) is potentially present within the project corridor. The project received a Not Likely to Adversely Affect (NLAA) Concurrence Letter from the USFWS for NLEB via the Federal Highway Administration Programmatic Biological Opinion (PBO) (refer to Appendix E).

According to a subsequent search of the IPaC database conducted in August 2024, NLEB are no longer likely to be present within the project corridor. The IPaC identified the potential presence of Tricolored bat (TCB) (*Perimyotis subflavus*) within the project corridor. The USFWS has proposed to list the TCB *endangered* under the Endangered Species Act (ESA). In advance of the uplisting of the TCB to endangered later this year, MassDOT will employ several avoidance and minimization measures in compliance with the ESA (refer to Appendix E).

Appendix A – Figures



USGS Topographical Map

Resurfacing and Related Work on Route 16

Legend

Project Corridor

N

Note:
- Topographical Survey 7.5 Minute Quadrangles for Blackstone, MA 2021.

Figure 1

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022



Aerial Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 2

HNTB

massDOT
Massachusetts Department of Transportation
Highway Division

Boston, MA | November 2022

Legend
- Project Corridor
- Town Boundaries

0 0.15 0.3 0.45 0.6 Miles

N



MassDEP Wetlands Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 3

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022



NWI Map
Resurfacing and Related Work on Route 16
Mendon, MA

Legend

- Project Corridor
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Lake
- Riverine
- Town Boundaries

0 0.15 0.3 0.45 0.6 Miles

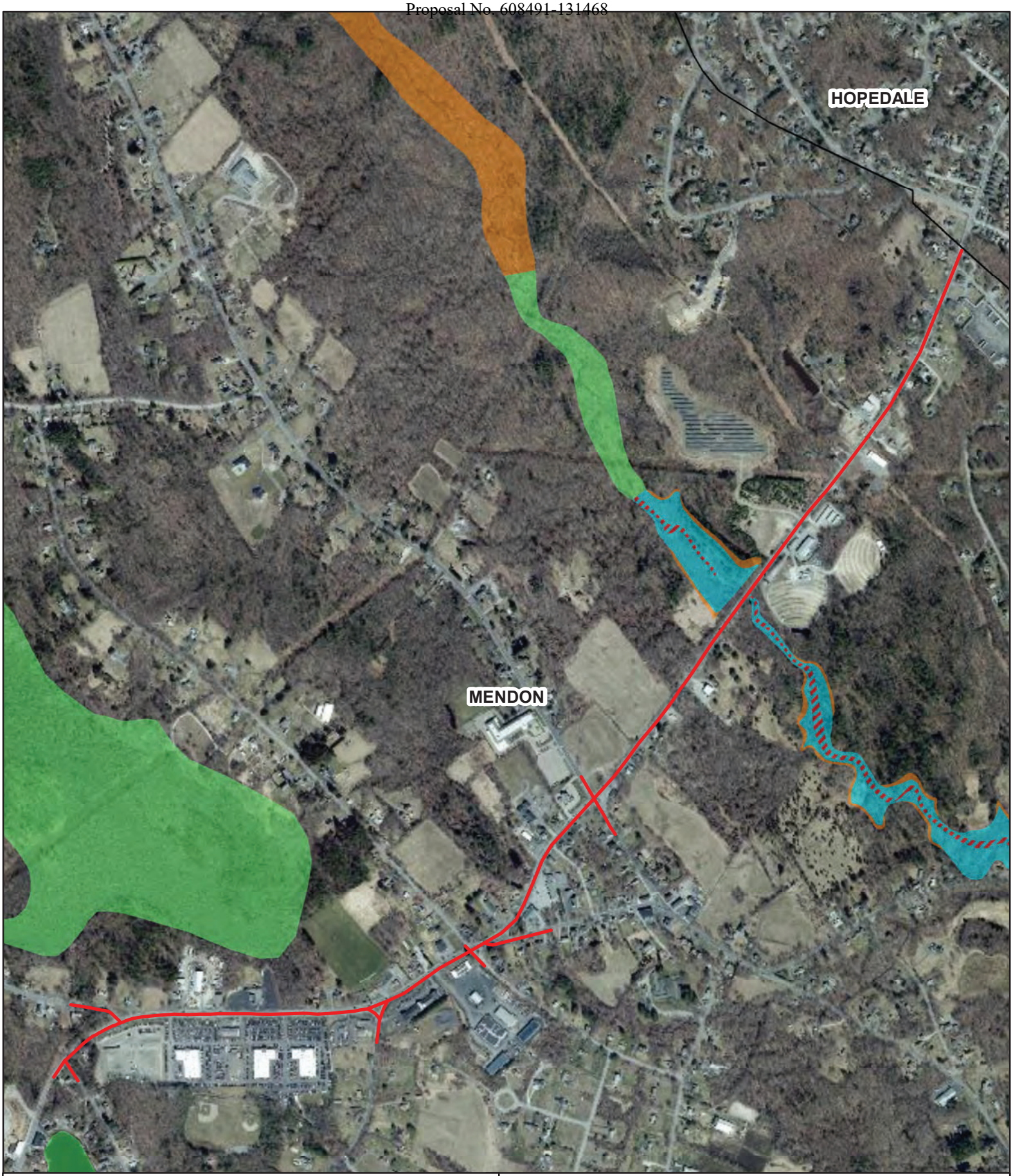
N

Figure 4

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022



FEMA Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 5

HNTB

massDOT
Massachusetts Department of Transportation
Highway Division

Boston, MA | November 2022

Legend

- Project Corridor
- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- X: 0.2% Annual Chance of Flooding
- Town Boundaries

0 0.15 0.3 0.45 0.6 Miles

N

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography. Base map files were provided in digital format by Massachusetts Geographic Information Systems (MassGIS). Ortho imagery was produced at a scale of 1:5,000. Aerial photography is dated April 2005.

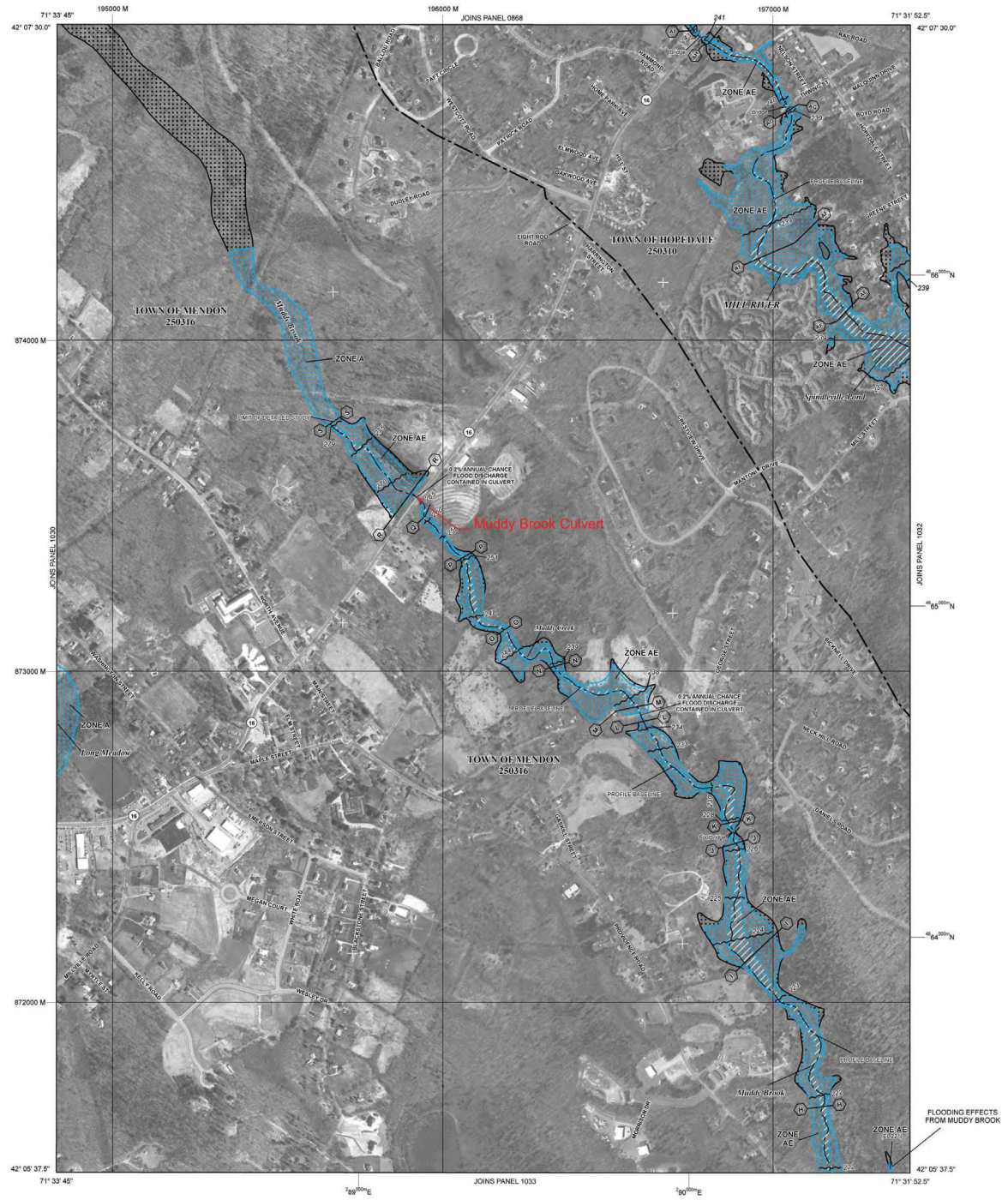
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A A — Cross section line
23 23 — Transect line
Culvert
Bridge
45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000 M — 1000-meter ticks: Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection
4689000 m N — 1000-meter Universal Transverse Mercator grid values, zone 19N
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
July 4, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1031E

FIRM

FLOOD INSURANCE RATE MAP

WORCESTER COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANEL 1031 OF 1075

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOPEDALE, TOWN OF	250310	1031	E
MENDON, TOWN OF	250316	1031	E

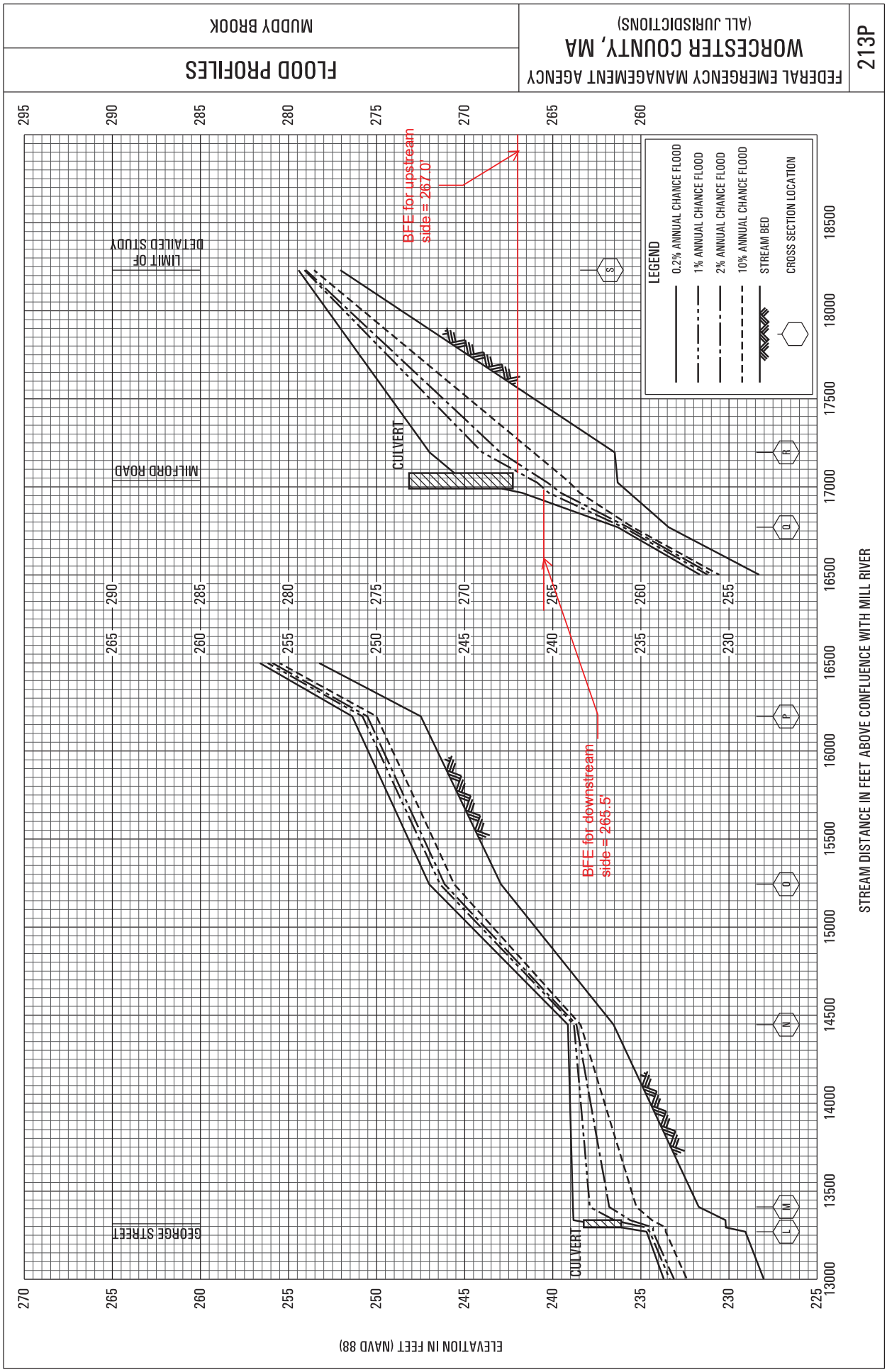
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

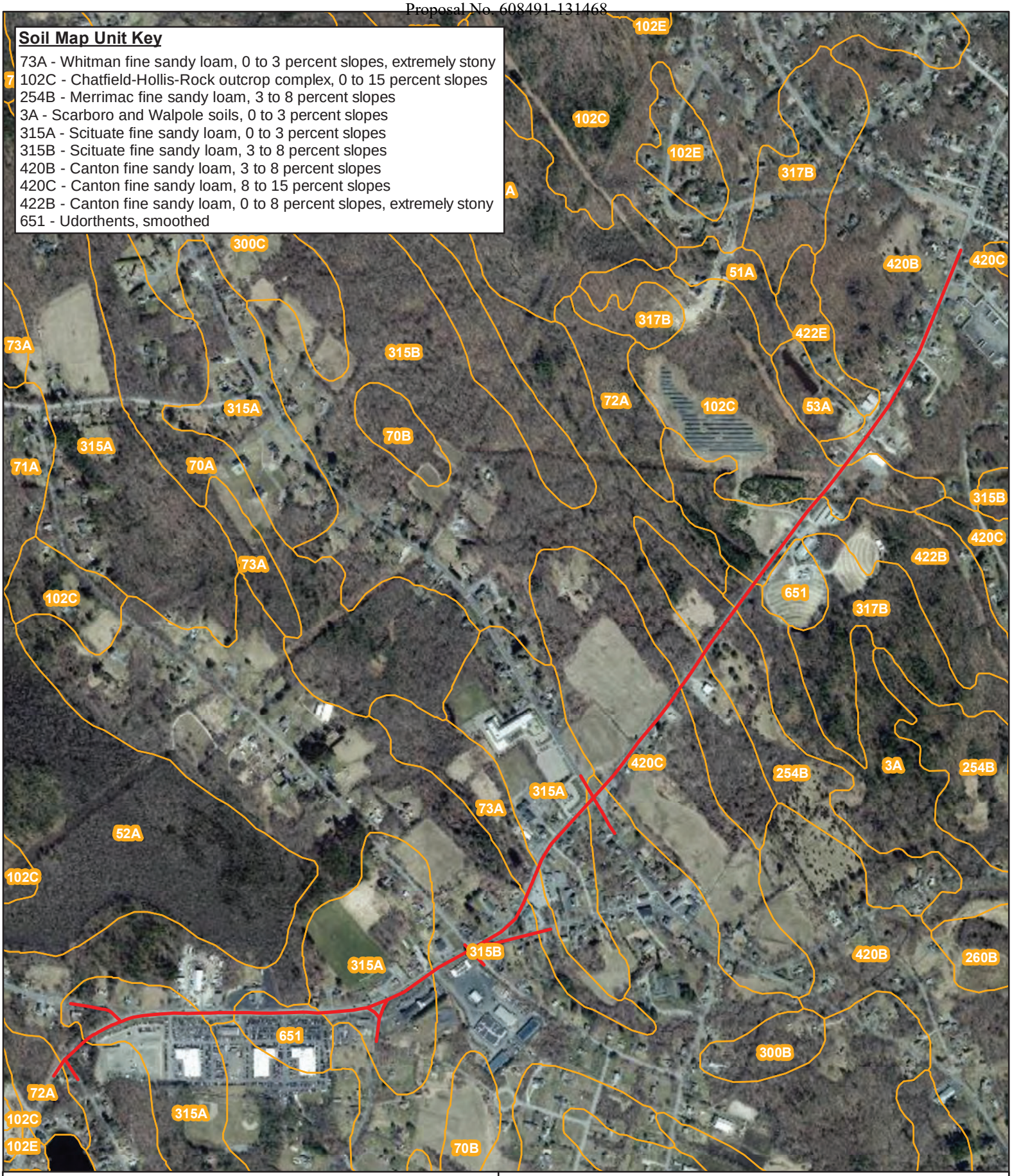
MAP NUMBER
25027C1031E
EFFECTIVE DATE
JULY 4, 2011

Federal Emergency Management Agency

A00830 - 35

Proposal No. 608491-131468


213P
FEDERAL EMERGENCY MANAGEMENT AGENCY
WORCESTER COUNTY, MA
(ALL JURISDICTIONS)
FLOOD PROFILES
MUDDY BROOK
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
BFE for upstream side = 267.0'
BFE for downstream side = 265.5'
CULVERT
CULVERT
MILFORD ROAD
LIMIT OF DETAILED STUDY
GEORGE STREET
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH MILL RIVER
ELEVATION IN FEET (NAVD 88)



Soils Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 6

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022

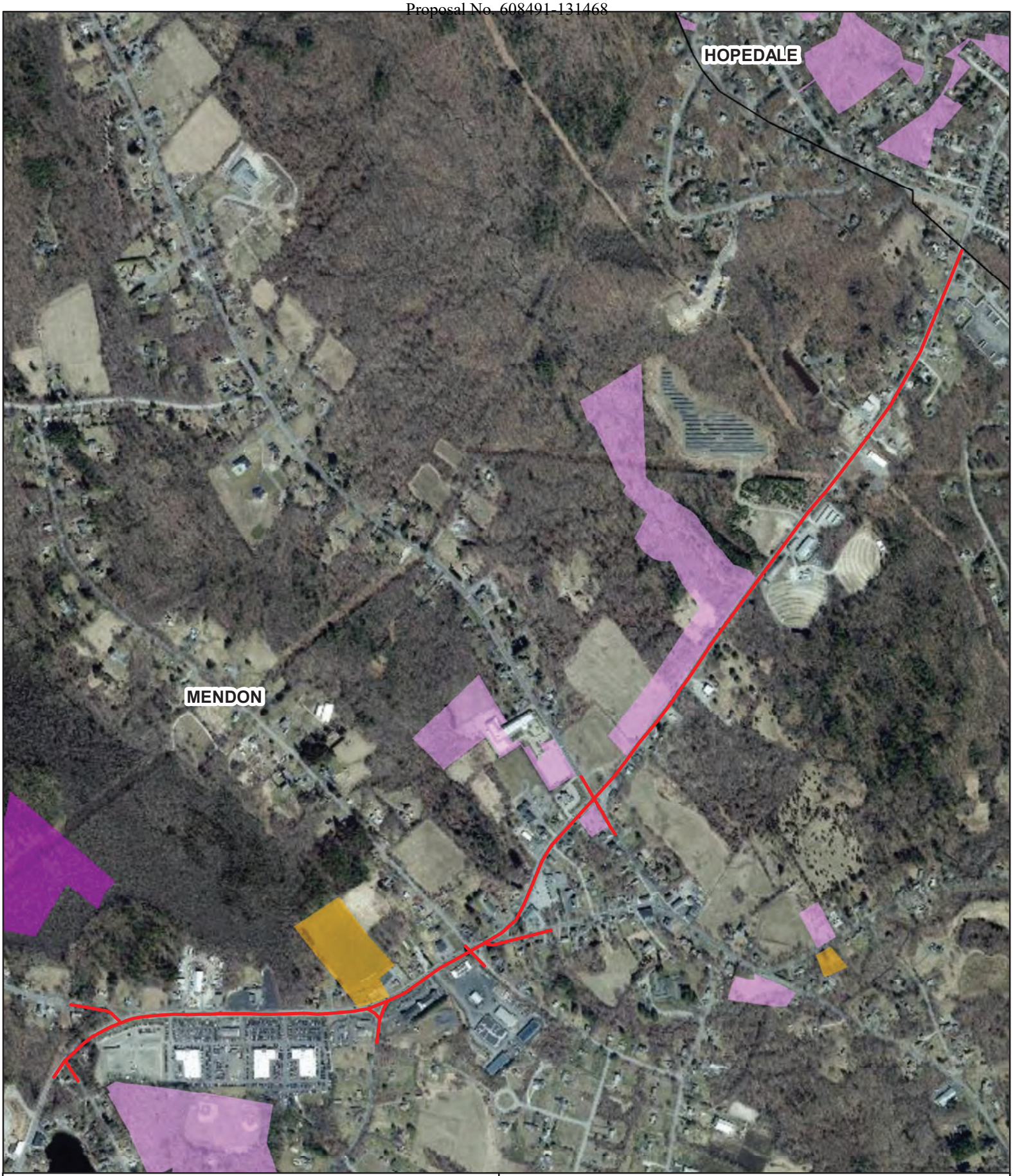
Legend

Project Corridor

Soil Map Unit

0 0.15 0.3 0.45 0.6 Miles

N



Open Space by Ownership Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 8

HNTB

massDOT
Massachusetts Department of Transportation
Highway Division

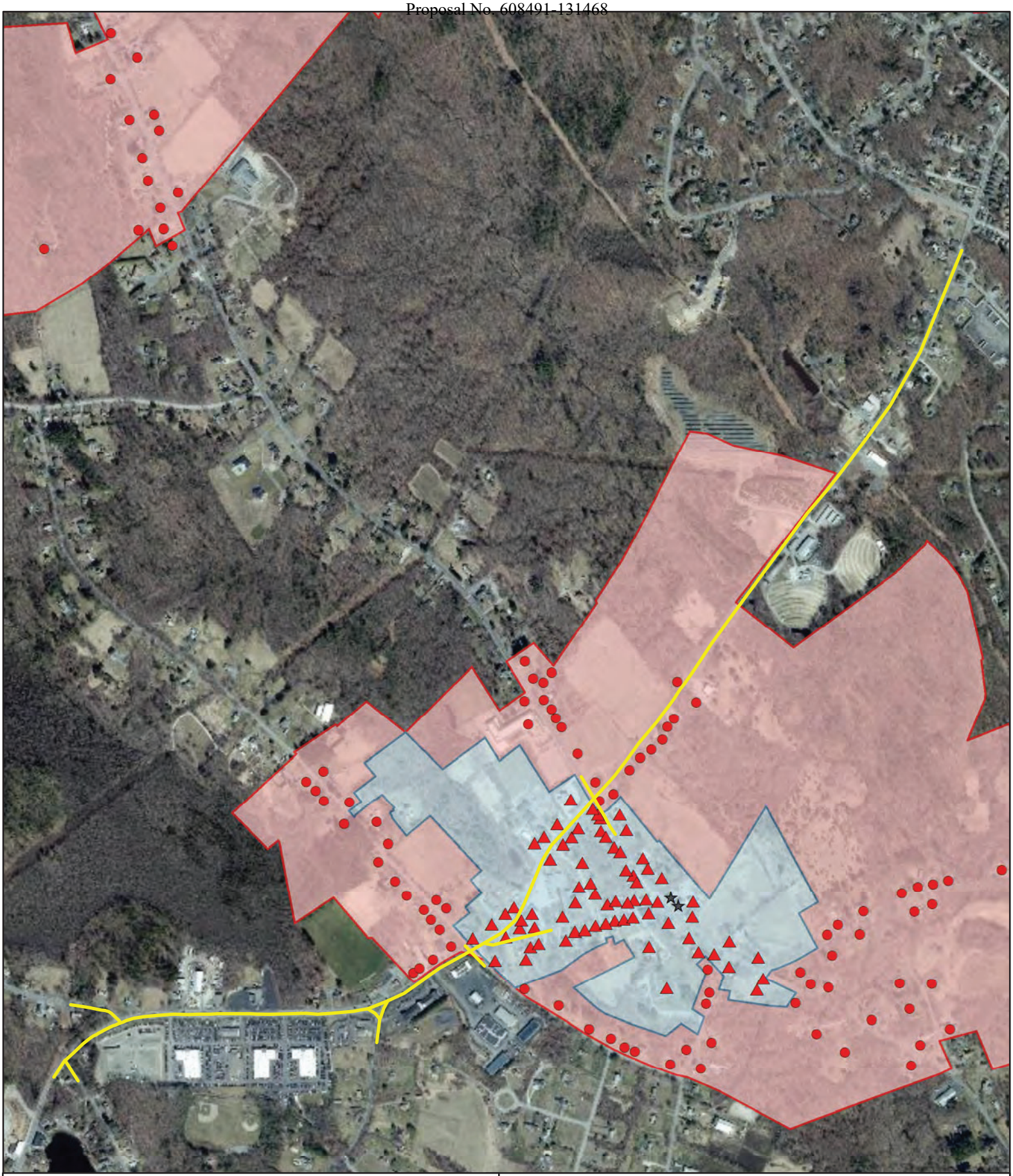
Boston, MA | November 2022

Legend

- Project Corridor
- Municipal
- Land Trust
- Private
- Town Boundaries

0 0.15 0.3 0.45 0.6 Miles

N



Cultural Resources Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 9

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022

Appendix B – Wetland Delineation Report, Memorandum, and Affidavit

HNTB Corporation
The HNTB Companies
Engineers Architects Planners

300 Apollo Drive
Chelmsford, MA 01824

Telephone (617) 542-6900
Facsimile (617) 428-6905
www.hntb.com

HNTB

Wetland Delineation Affidavit

Resurfacing and Related Work on Route 16 (Uxbridge Road)
Mendon, Massachusetts

1. Introduction

This affidavit is being provided to support a Notice of Intent (NOI) and a Section 404 Pre-Construction Notification (PCN) under General Permit (GP) #23 – Linear Transportation Projects and Wetland/Stream Crossings for work associated with pavement repair and resurfacing, bicycle and pedestrian accommodations including a shared-use path, and reconstruction of five (5) signalized intersections along Route 16 (Site) in Mendon, Massachusetts (Project).

Wetland resources within the vicinity of the Site were originally delineated by HNTB in accordance with the Massachusetts Department of Environmental Protection (MassDEP) and the U.S. Army Corps of Engineers (USACE) and the 2012 Northeast Regional Supplement on August 7th, 11th, and October 1st, 2020. Per 310 CMR 10.05(6)(3) and 33 U.S.C. 1344, a resource area delineation is valid for 3 and 5 years, respectfully. Therefore, the boundaries of resources on or adjacent to the Site were verified for accuracy on October 4th, 2023. Changes to the resource area boundaries identified during the field verification are summarized below.

2. Summary of Changes to Resource Area Boundaries

HNTB-A

No changes. The wetland boundary is greater than 100 feet from the edge of any proposed work, and no impacts to jurisdictional areas are proposed. Therefore, HNTB-A was not re-flagged.

HNTB-B

No changes. The wetland boundary is greater than 100 feet from the edge of any proposed work, and no impacts to jurisdictional areas are proposed. Therefore, HNTB-B was not re-flagged.

HNTB-C

Partial changes to the boundary of HNTB-C have been made. Upon review of the originally hung flags HNTB-C-1 through HNTB-C-4, this area no longer met the definition of a jurisdictional wetland. Vegetation observed within the previously delineated wetland included bracken fern (FACU), poison ivy (FAC), American burnweed (UPL), red maple (FAC), and Canadian goldenrod (FACU) as shown in Photo 1 below. No indicators of hydrology were present. Therefore, the delineated wetland boundary was updated as shown in Figure 3C. The revised wetland boundary begins further from the edge of the roadway and continues in a southeasterly direction before shifting west toward Muddy Brook. The revised wetland

boundary meets Muddy Brook at previously hung flag #HNTB-C-9. The GPS locations of previously hung flags HNTB-C-5 through HNTB-C-8 were also updated, as it appears that at the time of the original delineation, the GPS may have captured the location of the previously hung flags incorrectly.



Photo 1. Photo of area previously delineated as a portion of HNTB-C taken at flag HNTB-C-2. This area does not meet the definition of a jurisdictional wetland.

HNTB-E

No changes. HNTB was able to verify that the previously delineated boundary line remains accurate. In areas where previously hung flags were no longer visible or were unable to be located in the field, HNTB re-hung pink flagging at the GPS points where the previous flag had been hung.

HNTB-F

Partial changes to the boundary of HNTB-F have been made. Upon review of the area, the southern portion of HNTB-F has been extended to include the addition of a small scrub-shrub wetland area. Vegetation observed within this area included purple-stem aster (OBL), creeping jenny (FACW), sweet pepperbush (FAC), and late goldenrod (FACW). Several primary indicators of hydrology were present, including surface water, a high water table, and saturation, as shown in Photo 2 below, as well as an observed hydrogen sulfide odor. The revised wetland boundary continues north before tying into the previously delineated HNTB-F at flag #HNTB-F-8. The GPS locations of previously hung flags HNTB-F-1 through HNTB-F-6 were also updated, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly.





Photo 2 (left). Visible soil saturation at surface, indicative of a high water table.

Photo 3 (right). View of scrub-shrub wetland area not identified during original delineation. Note the abundance of purple-stem aster in red, an obligate wetland species.

HNTB-G

Partial changes to the boundary of HNTB-G have been made, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly. HNTB did not change the physical locations of any wetland flags; rather, the locations of the previously hung flags were updated using a GPS with sub-meter accuracy.

HNTB-H

No changes. HNTB was able to verify that the previously delineated boundary remains accurate. In areas where previously hung flags were no longer visible or were unable to be located in the field, HNTB re-hung pink flagging at the GPS points where the previous flags had been hung.

HNTB-I

No changes. HNTB was able to verify that the previously delineated boundary remains accurate. In areas where previously hung flags were no longer visible or were unable to be located in the field, HNTB re-hung pink flagging at the GPS points where the previous flag had been hung.

HNTB-J

No changes. The wetland boundary is greater than 100 feet from the edge of any proposed work, and no impacts to jurisdictional areas are proposed. Therefore, HNTB-J was not re-flagged.

Muddy Brook

Partial changes to the boundary of the Bank were made, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly. HNTB did

not change the physical locations of any Bank flags; rather, the locations of the previously hung flags were updated using a GPS with sub-meter accuracy.

Willow Brook

Partial changes to the boundary of the Bank were made, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly. HNTB did not change the physical locations of any Bank flags; rather, the locations of the previously hung flags were updated using a GPS with sub-meter accuracy.

Unnamed Stream Adjacent to HNTB-G

Partial changes to the boundary of the Bank were made, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly. HNTB did not change the physical locations of any Bank flags; rather, the locations of the previously hung flags were updated using a GPS with sub-meter accuracy.

3. Conclusion

Based on a field review of the Site, I certify under pains and penalties of perjury that the resource boundaries are accurately depicted on the updated wetland delineation maps dated October 5th, 2023 and the Environmental Site Plans submitted with the Notice of Intent and Section 404 Self-Verification Notification Form.

Jessica Marino, PWS Digitally signed by Jessica Marino, PWS DN: C=US, E=jemarino@hntb.com, O=HNTB, CN="Jessica Marino, PWS" Date: 2024.02.14 14:53:48-05'00'

Jessica Marino, PWS
Professional Wetland Scientist

October 5, 2023
Date

Attachments

- Updated Wetland Delineation Maps



Updated Delineation Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 3A

HNTB

massDOT
Massachusetts Department of Transportation
Highway Division

Boston, MA | October 2023

Legend

- Project Corridor
- Updated BVW Boundary
- Updated Bank Boundary
- Previously Delineated BVW Boundary
- Previously Delineated Bank Boundary

0 50 100 150 Feet

N



Updated Delineation Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 3B

HNTB

massDOT
Massachusetts Department of Transportation
Highway Division

Boston, MA | October 2023

Legend

- Project Corridor
- Updated BVW Boundary
- Updated Bank Boundary
- Previously Delineated BVW Boundary
- Previously Delineated Bank Boundary

0 40 80 120 Feet

N



Updated Delineation Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 3C

HNTB

massDOT
Massachusetts Department of Transportation
Highway Division

Boston, MA | October 2023

Legend

- Project Corridor
- Updated BVW Boundary
- Updated Bank Boundary
- Previously Delineated BVW Boundary
- Previously Delineated Bank Boundary

0 90 180 270 Feet

N

WETLAND DELINEATION REPORT

ROUTE 16 RESURFACING AND RELATED WORK

MENDON, MA

Prepared for:



Massachusetts Department of Transportation
Highway Division
10 Park Plaza
Boston, MA 02116

Submitted by:



HNTB Corporation
31 St. James Avenue
Boston, MA 02116

NOVEMBER 2020

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3. Methods 3
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Table 2 – Wetland Areas Summary Table 6

Appendices
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Appendix B – Field Data Forms and Photographs

1. INTRODUCTION

The Massachusetts Department of Transportation – Highway Division (MassDOT) is proposing roadway resurfacing and sidewalk rehabilitation to Route 16 in Mendon, MA (Project No. 608491). Route 16 will be resurfaced from just west of Taft Avenue to the Hopedale town line and upgrades will be made to the existing sidewalk on the north side of the roadway from Hartford Avenue West to North Avenue. A shared use path will be installed on the south side of the roadway for the entire length of the project. The project also includes safety improvements at the intersections, two new traffic signals at Hartford Avenue West and Maple Street, and a signal upgrade at North Avenue. The goal of the project is to improve pavement conditions and meet the goals of MassDOT's Healthy Transportation Policy.

HNTB Corporation performed a field delineation along the Route 16 corridor to identify wetlands and waterbodies that meet the criteria for federal or state regulation under Section 404 of the Clean Water Act (CWA) and/or the Massachusetts Wetlands Protection Act (MA WPA). Results will be used to facilitate environmental permitting, and construction planning and design efforts. Based on the proposed design, the wetland delineation effort was limited to evaluating wetlands within 200 feet of the existing roadway centerline.

Supplemental information supporting the wetlands and waters delineation is included in **Appendices A and B**, as follows:

Appendix A: Figures
Appendix B: Field Data Forms (Including Photographs)

2. BACKGROUND INFORMATION

Prior to the field investigation, HNTB wetland scientists conducted a desktop review of existing site information to aid in the identification of potential resources in the project area. Resources reviewed included:

- United States Geologic Survey (USGS) Topographic Quadrangle 7.5' series for Blackstone, MA, RI
- United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) GIS data
- The United States Department of Agriculture, Natural Resource Conservation Service (USDA-NRCS) *Web Soil Survey (WSS) for Worcester County, Massachusetts*
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM)

Results of the desktop review are described below:

Mapped NWI Wetlands and USGS Streams

USGS identified one intermittent stream (Willow Brook) and one perennial stream (Muddy Brook) intersecting the project area. Within 200 feet of the project area, NWI identified one palustrine forested wetland along Muddy Brook, south of Route 16; one palustrine emergent wetland along Willow Brook,

north of Route 16; and a palustrine forested wetland east of New England Steak and Seafood. All mapped NWI and USGS (25K) features are presented in **Appendix A, Figure 2**.

Soils

The USDA-NRCS WSS for Worcester County identified 11 mapped soil units within the project area as shown in **Table 1** and **Appendix A, Figure 3**. One hydric soil and two predominantly hydric soils were identified within the project area. Hydric soils can be indicative of the presence of wetland communities. No highly erodible soils were identified within the project area.

Table 1. Mapped Soils

Map Unit Symbol	Map Unit Name	K Factor*	Hydric Rating**	Drainage Class
3A	Scarboro and Walpole soils, 0 to 3 percent slopes	--	100	Very Poorly Drained
72A	Whitman fine sandy loam, 0 to 3 percent slopes	--	99	Very Poorly Drained
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	--	99	Very Poorly Drained
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	--	1	Well Drained
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	0.28	0	Somewhat Excessively Drained
315A	Scituate fine sandy loam, 0 to 3 percent slopes	0.20	10	Moderately Well Drained
315B	Scituate fine sandy loam, 3 to 8 percent slopes	0.20	5	Moderately Well Drained
420B	Canton fine sandy loam, 3 to 8 percent slopes	0.24	1	Well Drained
420C	Canton fine sandy loam, 8 to 15 percent slopes	0.24	0	Well Drained
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	--	4	Well Drained
651	Udorthents, smoothed	--	0	--

**Erodibility Coefficient – Value assigned to soil types by NRCS. K > 0.35 are considered to be highly erodible soils*

***Hydric Rating – Value is based on the percentage of hydric soils within the soil type. Non-hydric soils have a value of 0, predominantly non-hydric soils have a value between 0 and 33, partially hydric soils have a value between 33 and 66, predominantly hydric soils have a value between 66 and 99, and hydric soils have a value of 100.*

FEMA Floodplain

The FEMA 100-year floodplain associated with Muddy Brook comes within approximately 10 feet of

Route 16 to the south and approximately 50 feet of Route 16 to the north. Muddy Brook's regulatory floodway intersects the project area on the south side of Route 16. The 500-year floodplain in this area is contained within the culvert under Route 16. (**Appendix A, Figure 2**).

3. METHODS

Wetland scientists from HNTB performed a systematic field survey within the project limits on August 7, August 11, and October 1, 2020 to evaluate and delineate areas meeting wetland criteria. Wetland and non-wetland areas were initially identified based on representative plant communities and obvious hydrologic and topographic indicators. The delineation then involved the characterization of vegetation, soils, and hydrology, and pertinent observations on the three criteria were recorded on Wetland Determination Data Forms. Each delineated feature was given a unique identifier and photographed. Boundary points were identified for each feature, marked with survey flagging, and numbered consecutively. Boundary point positions were located using handheld GPS units and subsequently ground surveyed by Nitsch Engineering.

The wetland delineation was conducted in accordance with the methods described in the *U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual (1987 edition),* and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region dated January 2012.* Per the USACE 1987 manual, routine wetland determination methods with onsite inspection were used to determine the presence of wetlands in the project area.

4. FIELD INVESTIGATION RESULTS

As shown on **Figures 4A - 4E** in **Appendix A** and on the 25% Design Plans, ten wetlands and two streams were identified in the project area. Descriptions of the wetland areas, including information on vegetation, soils, and hydrologic conditions are provided below. Field Data Forms and Photographs for each feature are included in **Appendix B**.

Wetland HNTB-A (Flag # HNTB-A-1 – HNTB-A-5)

Wetland HNTB-A is located north of Route 16, west of 50 Milford Street. Wetland HNTB-A is designated as a palustrine scrub-shrub/emergent (PSS1/EM1E) wetland on NWI mapping and is dominated by red maple (*Acer rubrum*), red oak (*Quercus rubra*), sweet pepperbush (*Clethra alnifolia*), sensitive fern (*Onoclea sensibilis),* and royal fern (*Osmunda regalis*). Wetland hydrology indicators include saturation (A3) and water-stained leaves (B9). The hydric soil indicator for Wetland HNTB-A is histosol (A1). Wetland HNTB-A meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-B (Flag # HNTB-B-1 – HNTB-B-7)

Wetland HNTB-B is a manmade basin located north of Route 16, adjacent to HNTB-A. Wetland HNTB-B is designated as a palustrine scrub-shrub/emergent (PSS1/EM1E) wetland on NWI mapping and is dominated by phragmites (*Phragmites australis*) and soft rush (*Juncus effusus*). The wetland hydrology indicator for Wetland HNTB-B is water-stained leaves (B9) and the hydric soil indicators are sandy

redox (S5) and depleted matrix (F3). Wetland HNTB-B meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-C (Flag # HNTB-C-1 – HNTB-C-9)

Wetland HNTB-C is located north of Route 16, abutting Muddy Brook. This feature is not shown on NWI mapping. Wetland HNTB-C is dominated by red maple, gray birch (*Betula populifolia),* southern arrowwood (*Viburnum dentatum*), sensitive fern, skunk cabbage (*Symplocarpus foetidus*), poison ivy (*Toxicodendron radicans*), and Virginia creeper (*Parthenocissus quinquefolia*). Wetland hydrology indicators include drift deposits (B3) and water-stained leaves (B9). The hydric soil indicator for Wetland HNTB-C is sandy redox (S5). Wetland HNTB-C meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-D (Flag # HNTB-D-1 – HNTB-D-9)

Refer to description of HNTB-C above. Wetland HNTB-D also includes an intermittent stream that flows into Muddy Brook.

Wetland HNTB-E (Flag # HNTB-E-1 – HNTB-E-12)

Wetland HNTB-E is located south of Route 16, abutting Muddy Brook. Wetland HNTB-E is designated as a palustrine forested (PFO1E) wetland on NWI mapping and is dominated by red maple, speckled alder (*Alnus incana*), sensitive fern, giant goldenrod (*Solidago gigantea*), skunk cabbage, and jewelweed (*Impatiens capensis*). Wetland hydrology indicators include saturation (A3), water-stained leaves (B9), and geomorphic position (D2). The hydric soil indicator for Wetland HNTB-E is histosol (A1). Wetland HNTB-E meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-F (Flag # HNTB-F-1 – HNTB-F-10)

Wetland HNTB-F is located north of Route 16, abutting Willow Brook. Wetland HNTB-F is designated as a palustrine emergent (PEM1E) wetland on NWI mapping and is dominated by speckled alder, broadleaf cattail (*Typha latifolia*), and jewelweed. Wetland hydrology indicators include saturation (A3) and geomorphic position (D2). The hydric soil indicator for Wetland HNTB-E is histic epipedon (A2). Wetland HNTB-F meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-G (Flag # HNTB-G-1 – HNTB-G-10)

Wetland HNTB-G is located north of Route 16, east of New England Steak and Seafood. Wetland HNTB-G is designated as a palustrine forested (PFO1E) wetland on NWI mapping and is dominated by red maple, quaking aspen (*Populus tremuloides*), speckled alder, skunk cabbage, and sensitive fern. Wetland hydrology indicators include surface water (A1), high water table (A2), and saturation (A3). HNTB-G includes a channel with standing water. The hydric soil indicator for Wetland HNTB-G is depleted matrix (F3). Wetland HNTB-G meets all three wetland parameters and is considered a

jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-H (Flag # HNTB-H-1 – HNTB-H-16)

Wetland HNTB-H is located south of Route 16, west of Taft Avenue, and is connected to Wetland HNTB-I via a culvert under Route 16. This feature is not shown on NWI mapping. Wetland HNTB-H is dominated by red maple, sweet pepperbush, southern arrowwood, winterberry (*Ilex verticillata*), reed canary grass (*Phalaris arundinacea*), and poison ivy. Wetland hydrology indicators include high water table (A2), saturation (A3), inundation visible on aerial imagery (B7), water-stained leaves (B9), drainage patterns (B10), aquatic fauna (B13), and geomorphic position (D2). Wetland HNTB-H includes three culverts, one of which is incised with standing water at the opening. Wetland HNTB-H includes a small drainage channel located between flags H-9 and H-10. The hydric soil indicator for Wetland HNTB-H is depleted dark surface (F7). Wetland HNTB-H meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-I (Flag # HNTB-I-1 – HNTB-I-12)

Wetland HNTB-I is located north of Route 16, west of Taft Avenue and is connected to Wetland HNTB-H via a culvert under Route 16. See Wetland HNTB-H description above for description of Wetland HNTB-I.

Wetland HNTB-J (Flag # HNTB-J-1 – HNTB-J-11)

Wetland HNTB-J is located north of Route 16, east of HNTB-I. This feature is not shown on NWI mapping. Wetland HNTB-J is dominated by red maple, black cherry (*Prunus serotina*), winterberry, ostrich fern (*Matteuccia struthiopteris*), jewelweed, Virginia creeper, and greenbrier (*Smilax rotundifolia*). Wetland hydrology indicators include saturation (A3), geomorphic position (D2), and microtopographic relief (D4). The hydric soil indicator for Wetland HNTB-J is depleted matrix (F3). Wetland HNTB-J meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Muddy Brook (Flag # HNTB-Bank-1–9 & HNTB-Bank-1–11)

Muddy Brook is a perennial stream located west of Mendon Drive-In that flows east through a culvert under Route 16 and abuts Wetlands HNTB-C, HNTB-D, and HNTB-E. This feature has a natural channel shape with moderately eroded banks and 2:1 and 3:1 side slopes. The channel is approximately 10 to 15 feet wide and 0 to 12 inches deep. The substrate of Muddy Brook includes cobble, sand, and gravel. Indicators of ordinary high water (OHW) include a clear, natural line impressed on the bank, shelving, sediment deposition, presence of flood/litter debris, sediment sorting, scour, and observed flow. The right and left banks consist of forested wetland. Muddy Brook is a tributary to a navigable water and meets the requirements of a jurisdictional feature under the CWA. Under the MA WPA, Muddy Brook is jurisdictional as Bank, Land Under Water, and includes 200-foot Riverfront Area starting at the mean annual high water line.

Willow Brook (Flag # HNTB-Bank-1 – HNTB-Bank-10)

Willow Brook is an intermittent stream located east of Washington Street that flows east through a culvert under Route 16 and abuts Wetlands HNTB-F. This feature includes a weir structure approximately 15 feet from the culvert opening west of Route 16, and stone wall banks between Route 16 and Maple Street. Willow Brook has moderately stable banks and 2:1 and 3:1 side slopes. The channel is approximately 8 feet wide and 0 to 12 inches deep. The substrate of Willow Brook includes sand, gravel, and muck. Indicators of ordinary high water (OHW) include a clear, natural line impressed on the bank, shelving, sediment deposition, water staining, scour, and observed flow. The right and left banks consist of forested wetland and upland areas. Willow Brook is a tributary to a navigable water and meets the requirements of a jurisdictional feature under the CWA. Under the MA WPA, Willow Brook is jurisdictional as Bank.

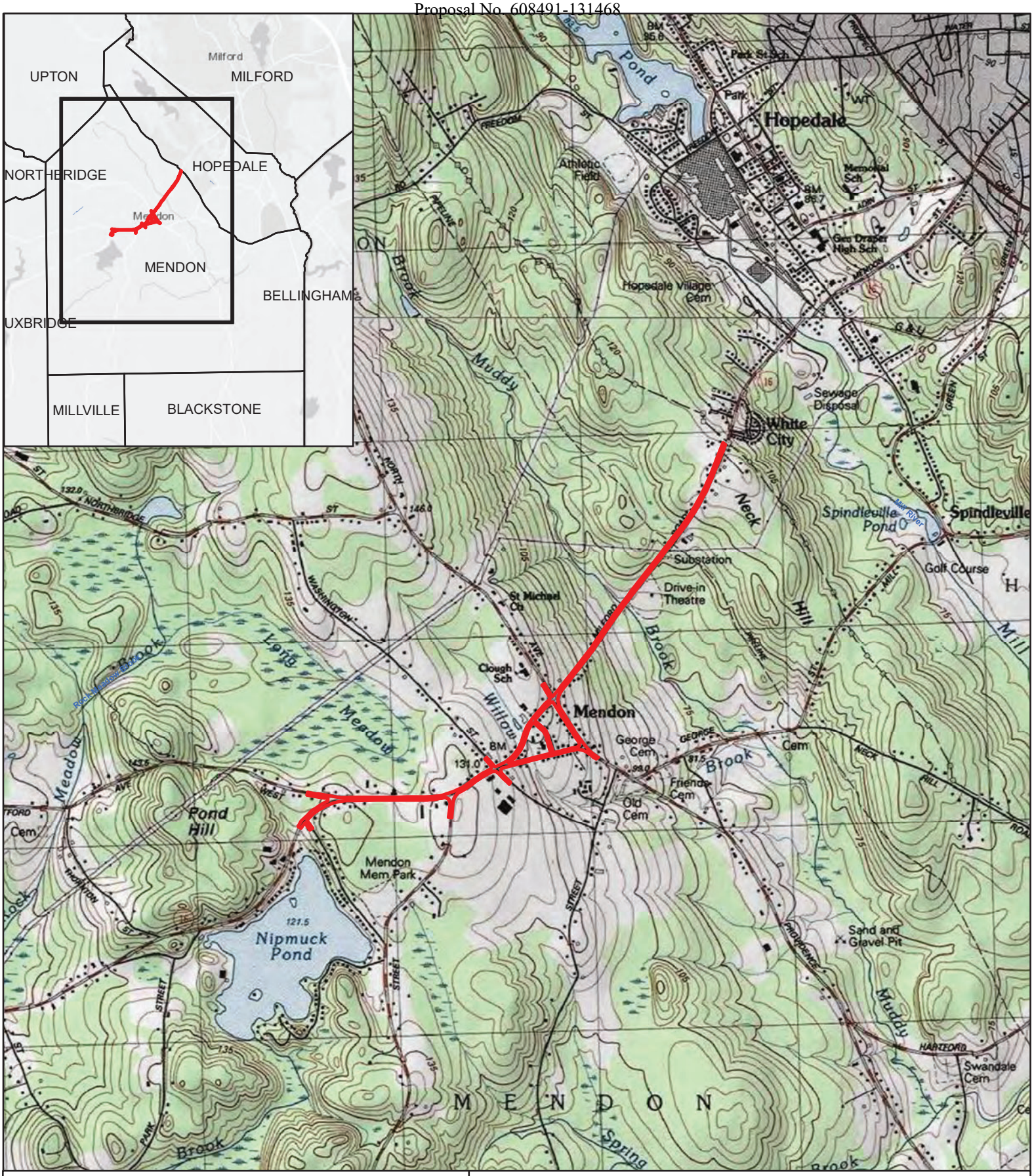
Table 1: Wetland Areas Summary

Wetland	NWI Class.	Dominant Plant Species	Hydrology Indicators	Hydric Soil Indicator	USACE Jurisdictional?	MA WPA Regulated Features
HNTB-A	PSS1/EM1E	*-Acer rubrum* *-Quercus rubra* *-Clethra alnifolia* *-Onoclea sensibilis* *-Osmunda regalis*	-Saturation (A3) -Water stained leaves (B9)	Histosol (A1)	Yes	BVW
HNTB-B	PSS1/EM1E	*-Phragmites australis* *-Juncus effusus*	-Water stained leaves (B9)	-Sandy redox (S5) -Depleted matrix (F3)	Yes	BVW
HNTB-C	PFO	*-Acer rubrum* *-Betula populifolia* *-Viburnum dentatum* *-Onoclea sensibilis* *-Symplocarpus foetidus* *-Toxicodendron radicans* *-Parthenocissus quinquefolia*	-Drift deposits (B3) -Water stained leaves (B9)	Sandy redox (S5)	Yes	BVW
HNTB-D	PFO	*-Acer rubrum* *-Betula populifolia* *-Viburnum dentatum* *-Onoclea sensibilis* *-Symplocarpus foetidus* *-Toxicodendron radicans* *-Parthenocissus quinquefolia*	-Drift deposits (B3) -Water stained leaves (B9)	Sandy redox (S5)	Yes	BVW
HNTB-E	PFO1E	*-Acer rubrum* *-Alnus incana* *-Onoclea sensibilis* *-Solidago gigantea* *-Symplocarpus foetidus* *-Impatiens capensis*	-Saturation (A3) -Water stained leaves (B9) -Geomorphic position (D2)	Histosol (A1)	Yes	BVW

Table 1: Wetland Areas Summary						
Wetland	NWI Class.	Dominant Plant Species	Hydrology Indicators	Hydric Soil Indicator	USACE Jurisdictional?	MA WPA Regulated Features
HNTB-F	PEM1E	*-Alnus incana* *-Typha latifolia* *-Impatiens capensis*	-Saturation (A3) -Geomorphic position (D2)	Histic Epipedon (A2)	Yes	BVW
HNTB-G	PFO1E	*-Acer rubrum* *-Populus tremuloides,* *-Alnus incana* *-Onoclea sensibilis* *-Symplocarpus foetidus*	-Surface water (A1) -High water table (A2) -Saturation (A3)	Depleted Matrix (F3)	Yes	BVW
HNTB-H	PEM/PFO	*-Acer rubrum* *-Clethra alnifolia* *-Viburnum dentatum* *-Ilex verticillata* *-Phalaris arundinacea* *-Toxicodendron radicans*	-High water table (A2) -Saturation (A3) -Inundation visible on aerial (B7) -Water stained leaves (B9) -Drainage patterns (B10) -Geomorphic position (D2)	Depleted Dark Surface (F7)	Yes	BVW
HNTB-I	PEM/PFO	*-Acer rubrum* *-Clethra alnifolia* *-Viburnum dentatum* *-Ilex verticillata* *-Phalaris arundinacea* *-Toxicodendron radicans*	-High water table (A2) -Saturation (A3) -Inundation visible on aerial (B7) -Water stained leaves (B9) -Drainage patterns (B10) -Geomorphic position (D2)	Depleted Dark Surface (F7)	Yes	BVW
HNTB-J	PFO	*-Acer rubrum* *-Prunus serotina* *-Ilex verticillata* *-Matteuccia struthiopteris* *-Impatiens capensis* *-Parthenocissus quinquefolia* *-Smilax rotundifolia*	-Saturation (A3) -Geomorphic position (D2) -Microtopographic Relief (D4)	Depleted Matrix (F3)	Yes	BVW
Muddy Brook	Perennial	N/A	N/A	N/A	Yes	Bank, LUW, RA
Willow Brook	Intermittent	N/A	N/A	N/A	Yes	Bank

APPENDIX A

FIGURES



Project Location Map

Route 16 Resurfacing and Related Work

Legend

Project Boundary

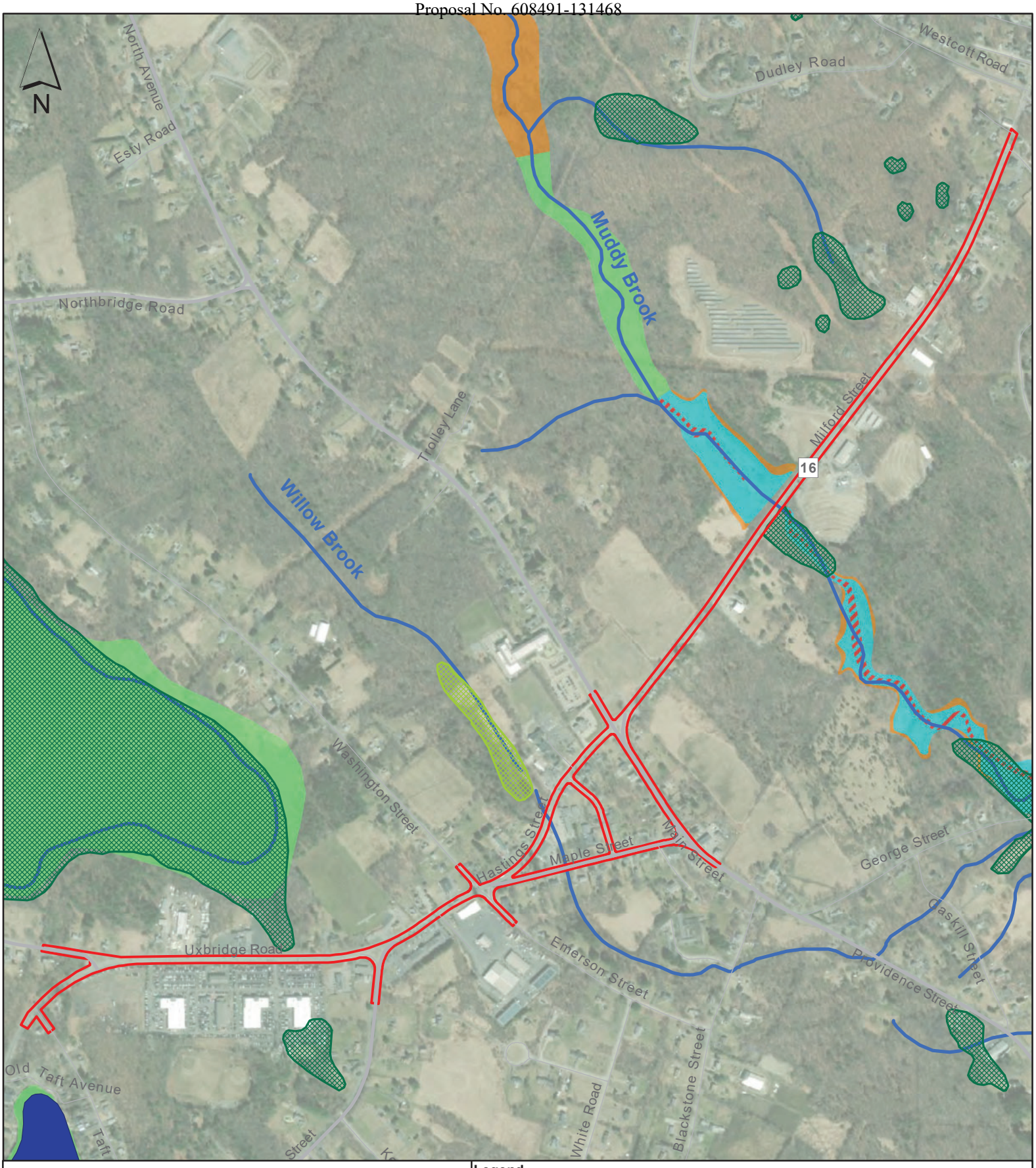
Figure 1

HNTB massDOT

Mendon, MA | September 2020

Note:
- Basemap obtained from ESRI.

0 2,000 4,000 Feet



Natural Resources Map

Route 16 Resurfacing and Related Work

Figure 2

HNTB massDOT

Mendon, MA | September 2020

Legend

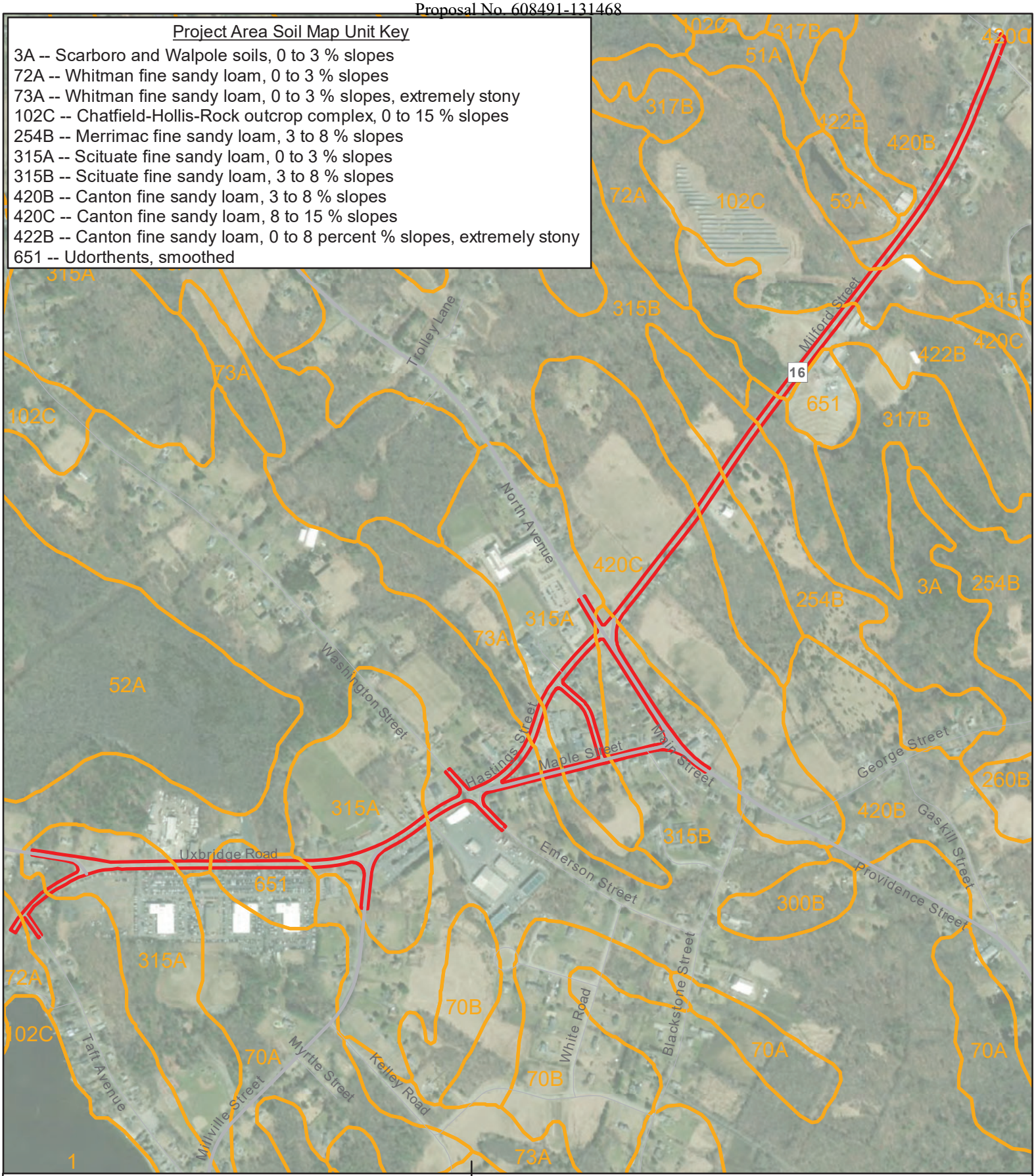
- Project Boundary
- NWI Freshwater Emerg. Wet.
- NWI Freshwater Forest/Shrub Wet.
- Freshwater Pond
- NWI Lake
- USGS 25K Streams

FEMA Flood Zones

- A: 1% Annual Chance of Flood, no BFE
- AE: 1% Annual Chance of Flood, with BFE
- AE: Regulatory Floodway
- X: 0.2% Annual Chance of Flood

Note:
- Basemap obtained from ESRI.

0 1,000 2,000 Feet



USDA NRCS Soils Map

Route 16 Resurfacing and Related Work

Legend

- USDA NRCS Soil Boundary
- Project Boundary

N

Figure 3

HNTB massDOT

Mendon, MA | September 2020

Note:
- Basemap obtained from ESRI.

0 1,000 2,000 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Figure 4A

HNTB massDOT

Mendon, MA | September 2020

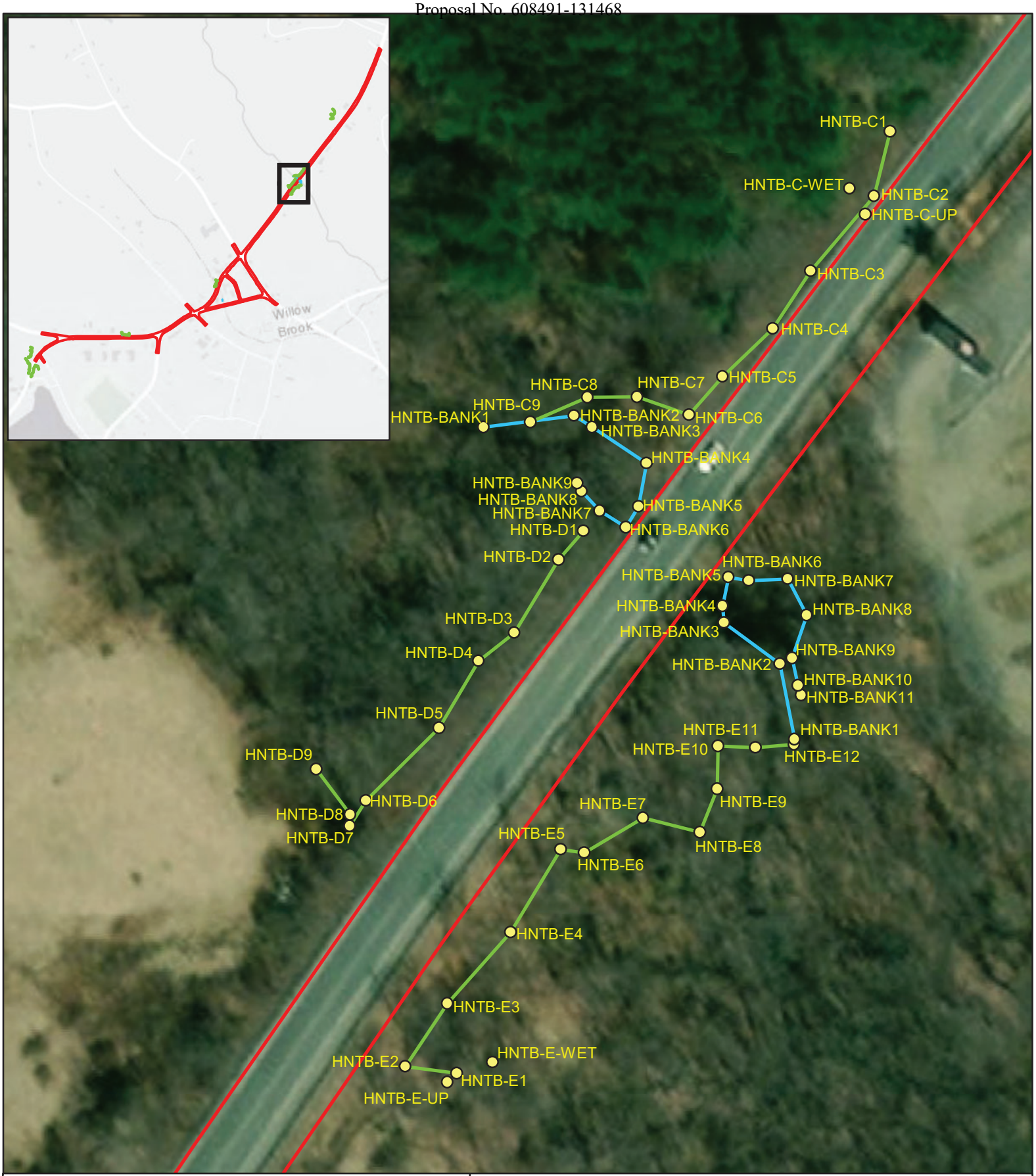
Legend

- Wetland Flags
- Wetland Boundary
- Project Boundary

N

Note:
- Basemap obtained from ESRI.

0 75 150 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Figure 4B

HNTB massDOT

Mendon, MA | September 2020

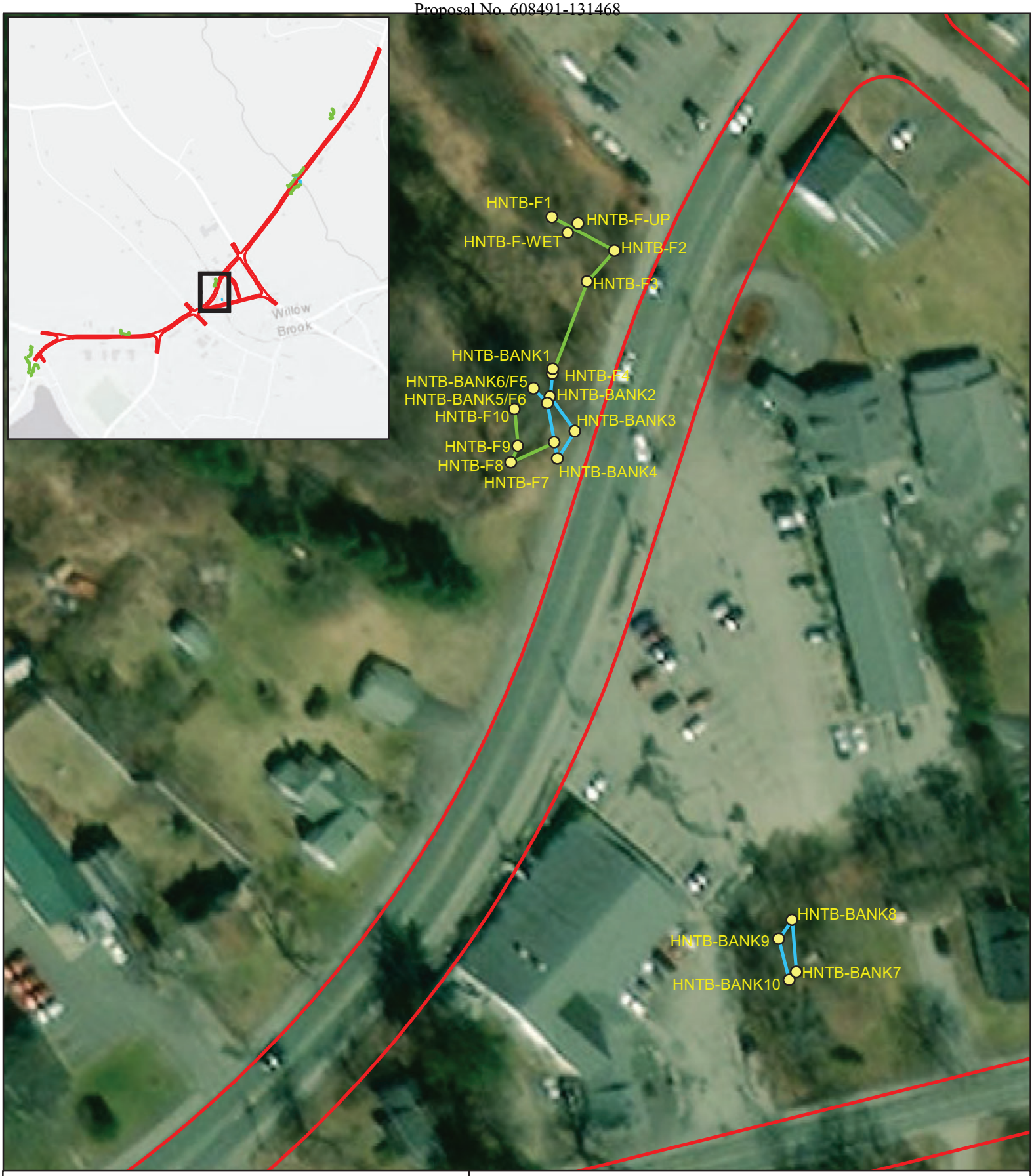
Legend

- Wetland Flags
- Wetland Boundary
- Bank Boundary
- Project Boundary

N

Note:
- Basemap obtained from ESRI.

0 75 150 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Figure 4C

HNTB massDOT

Mendon, MA | September 2020

Legend

- Wetland Flags
- Wetland Boundary
- Bank Boundary
- Project Boundary

N

Note:
- Basemap obtained from ESRI.

0 75 150 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Figure 4D

HNTB massDOT

Mendon, MA | September 2020

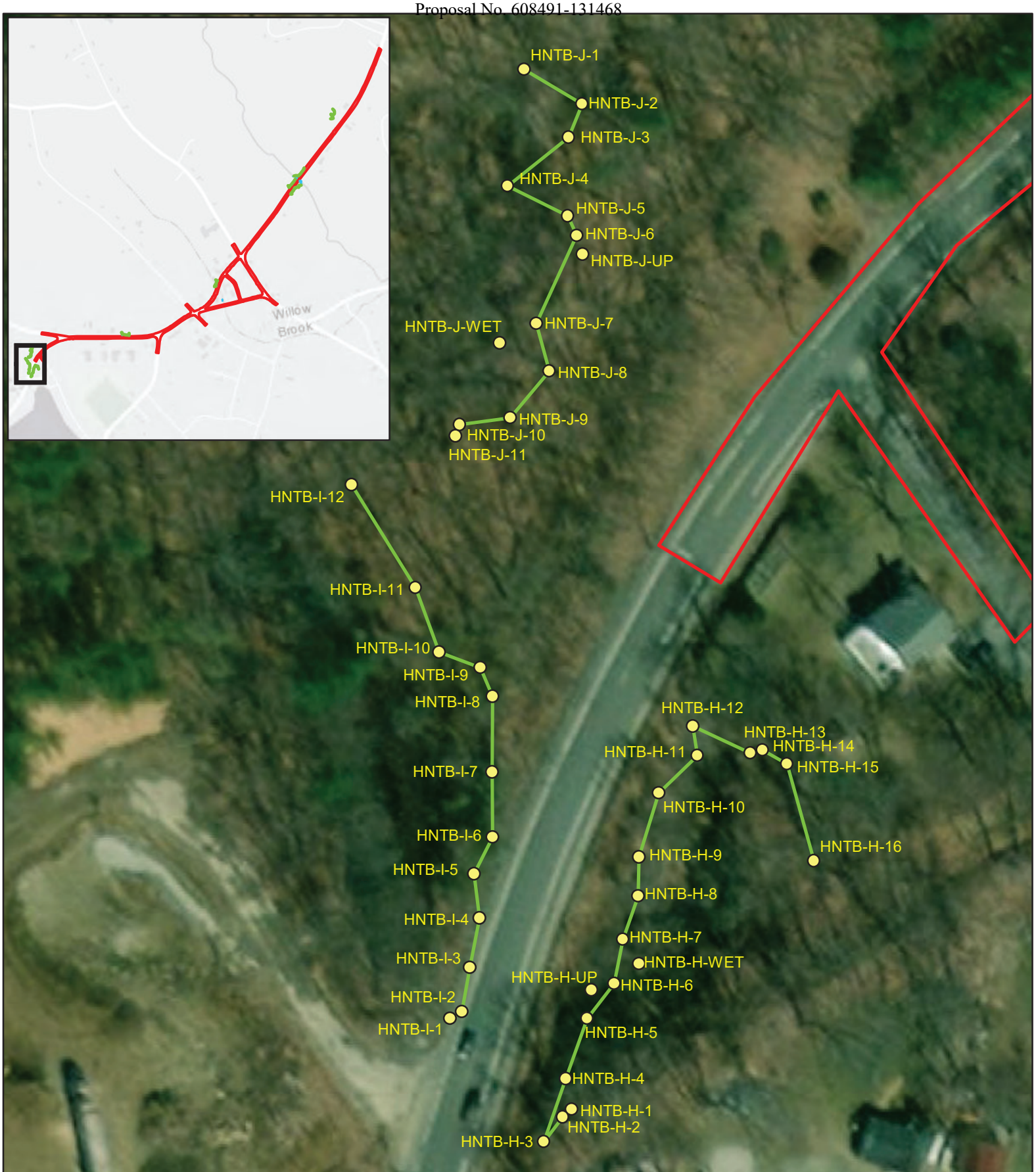
Legend

- Wetland Flags
- Wetland Boundary
- Bank Boundary
- Project Boundary

N

Note:
- Basemap obtained from ESRI.

0 75 150 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Legend

- Wetland Flags
- Wetland Boundary
- Project Boundary

N

Figure 4E

HNTB massDOT

Mendon, MA | September 2020

Note:
- Basemap obtained from ESRI.

0 75 150 Feet

APPENDIX B

FIELD DATA FORMS AND PHOTOGRAPHS

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-A WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range: Flag #s: HNTB-A-1 - HNTB-A-5

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.115453 Long: -71.546759 Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: PSS1/EM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-A WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	80	Yes	FAC
2. Quercus alba	40	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	120	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Clethra alnifolia	40	Yes	FAC
2. Ligustrum vulgare	3	No	FACU
3.			
4.			
5.			
6.			
7.			
	43	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Onoclea sensibilis	40	Yes	FACW
2. Osmunda regalis	25	Yes	OBL
3. Toxicodendron radicans	10	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-A WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-20"	10YR 2/1	100					Oa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☑ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-A Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Slope Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.115400 Long: -71.546992 Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-A Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus alba	60	Yes	FACU
2. Acer rubrum	40	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	100	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Hamamelis virginiana	60	Yes	FACU
2. Clethra alnifolia	40	Yes	FAC
3. Quercus alba	10	No	FACU
4.			
5.			
6.			
7.			
	110	= Total Cover	
Herb Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	0	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	80	x 3 =	240
FACU species	130	x 4 =	520
UPL species	0	x 5 =	0
Column Totals:	210 (A)		760 (B)

Prevalence Index = B/A = 3.6

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-A Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3"	10YR 3/3	100					LS	
3-16"	10YR 6/4	100					LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-B WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range: Flag #s: HNTB-B-1 - HNTB-B-7

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.115680 Long: -71.546859 Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: PSS1/EM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Manmade basin

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-B WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Phragmites australis	80	Yes	FACW
2. Juncus effusus	25	Yes	OBL
3. Lythrum salicaria	15	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	120 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-B WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 5/1	80	10YR 4/4	20			LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☑ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-B Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Convex Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.115661 Long: -71.546865 Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-B Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Solidago canadensis	80	Yes	FACU
2. Ambrosia artemisiifolia	20	No	FACU
3. Daucus carota	15	No	UPL
4. Conyza canadensis	10	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	125 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	110	x 4 =	440
UPL species	15	x 5 =	75
Column Totals:	125 (A)		515 (B)

Prevalence Index = B/A = 4.12

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-B Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4"	10YR 4/4	100					LS	Fill
4-12"	10YR 5/3	100					LS	Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-C&D WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.112577 Long: -71.548987 Datum: NAD83

Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: Not shown on NWI

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

HNTB-D same as HNTB-C. Datapoint within HNTB-C, but also representative of HNTB-D.

Flag #s:
HNTB-C-1 - HNTB-C-9
HNTB-D-1 - HNTB-D-9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☑ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-C&D WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	70	Yes	FAC
2. Betula populifolia	20	Yes	FAC
3. Pinus strobus	5	No	FACU
4. Ulmus americana	5	No	FACW
5.			
6.			
7.			
	100	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1. Acer rubrum	50	Yes	FAC
2. Viburnum dentatum	10	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	60	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Onoclea sensibilis	20	Yes	FACW
2. Symplocarpus foetidus	15	Yes	OBL
3. Toxicodendron radicans	15	Yes	FAC
4. Parthenocissus quinquefolia	15	Yes	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	65	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 88% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-C&D WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 2/2	80	10YR 5/6	20	C	M	SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☑ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-C & D Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.112577 Long: -71.548987 Datum: NAD83

Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HNTB-D Up same as HNTB-C Up. Datapoint within HNTB-C Up, but also representative of HNTB-D Up.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-C & D Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus alba	30	Yes	FACU
2. Betula populifolia	20	Yes	FAC
3. Acer rubrum	15	Yes	FACU
4.			
5.			
6.			
7.			
	65	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1. Acer rubrum	40	Yes	FAC
2. Diervilla lonicera	15	Yes	UPL
3. Fraxinus americana	5	No	FACU
4.			
5.			
6.			
7.			
	60	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Vitis labrusca	15	Yes	FACU
2. Pteridium aquilinum	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 29% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	60	x 3 =	180
FACU species	75	x 4 =	300
UPL species	15	x 5 =	75
Column Totals:	150 (A)		555 (B)

Prevalence Index = B/A = 3.7

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-C & D Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16"	10YR 4/4	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-E WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range: Flag #s: HNTB-E-1 - HNTB-E-12

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.111237 Long: -71.549718 Datum: NAD83

Soil Map Unit Name: Merrimac fine sandy loam, 3 to 8 percent slopes NWI classification: PFO1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

Abuts Muddy Brook

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-E WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	30	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Alnus incana	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Onoclea sensibilis	40	Yes	FACW
2. Solidago gigantea	40	Yes	FACW
3. Symplocarpus foetidus	30	Yes	OBL
4. Impatiens capensis	30	Yes	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	150	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-E WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-16"	10YR 2/2	100					Oa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☑ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remar



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-E Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.111219 Long: -71.549790 Datum: NAD83

Soil Map Unit Name: Merrimac fine sandy loam, 3 to 8 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	
Wetland Hydrology Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-E Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ulmus americana	30	Yes	FACW
2. Catalpa bignonioides	20	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Solidago canadensis	40	Yes	FACU
2. Onoclea sensibilis	30	Yes	FACW
3. Upland grass	25	Yes	UPL
4. Toxicodendron radicans	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1. Rosa multiflora	40	Yes	FACU
2. Celastrus orbiculatus	40	Yes	UPL
3. Parthenocissus quinquefolia	10	No	FACU
4.			
	90	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 29% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	5	x 3 =	15
FACU species	110	x 4 =	440
UPL species	65	x 5 =	325
Column Totals:	240 (A)		900 (B)

Prevalence Index = B/A = 3.75

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-E Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 5/3	100					S	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-F WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range: Flag #s: HNTB-F-1 - HNTB-F-10

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.106330 Long: -71.555430 Datum: NAD83

Soil Map Unit Name: Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

Abuts Willow Brook

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-F WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Alnus incana	40	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	40 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Typha latifolia	90	Yes	OBL
2. Impatiens capensis	60	Yes	FACW
3. Solidago gigantea	40	No	FACW
4. Toxicodendron radicans	20	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	210 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-F WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 2/2	100					Oa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☑ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-F Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.106376 Long: -71.555372 Datum: NAD83

Soil Map Unit Name: Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-F Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer platanoides	20	Yes	UPL
2. Catalpa bignonioides	20	Yes	FACU
3. Acer negundo	20	Yes	FAC
4. Fraxinus americana	15	Yes	FACU
5.			
6.			
7.			
	75	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1. Fraxinus americana	5	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	5	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Toxicodendron radicans	50	Yes	FAC
2. Dichanthelium clandestinum	50	Yes	FACW
3. Solidago canadensis	20	No	FACU
4. Sedum acre	20	No	UPL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	140	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1. Celastrus orbiculatus	30	Yes	UPL
2. Toxicodendron radicans	5	No	FAC
3.			
4.			
	35	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 38% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	50	x 2 =	100
FAC species	75	x 3 =	225
FACU species	60	x 4 =	240
UPL species	70	x 5 =	350
Column Totals:	255 (A)		915 (B)

Prevalence Index = B/A = 3.6

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-F Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 5/3	100					SI	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/11/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-G Wet

Investigator(s): M. Turgeon Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Slope Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: -71.562545 Long: 42.103473 Datum: NAD83

Soil Map Unit Name: Scituate fine sandy loam, 3 to 8 percent slopes NWI classification: PFO1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

Standing water in channel

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☑	No ☐	Depth (inches): 5"
Water Table Present?	Yes ☑	No ☐	Depth (inches): 8"
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-G Wet

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum, red maple	60	yes	fac
2.			
3.			
4.			
5.			
6.			
7.			
	60 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Populus tremuloides, quaking aspen	5	yes	facu
2. Alnus incana, speckled alder	15	yes	facw
3.			
4.			
5.			
6.			
7.			
	20 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Symplocarpus foetidus, skunk cabbage	50	yes	obl
2. Onoclea sensibilis, sensitive fern	30	yes	facw
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	50	x 1 =	50
FACW species	45	x 2 =	90
FAC species	60	x 3 =	180
FACU species	5	x 4 =	20
UPL species		x 5 =	
Column Totals:	160 (A)		340 (B)

Prevalence Index = B/A = 2.1

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-G Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
8"	10YR 4/2	100					sl	
12"	10YR 5/1	80%	10 YR 4/4	20			sl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐



Description: View of wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/11/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-G Up

Investigator(s): M. Turgeon Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Slope Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: -71.562574 Long: 42.103476 Datum: NAD83

Soil Map Unit Name: Scituate fine sandy loam, 3 to 8 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [ ]	No [✓]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soil Present?	Yes [ ]	No [✓]	
Wetland Hydrology Present?	Yes [ ]	No [✓]	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres on Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Stunted or Stressed Plants (D1)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] Microtopographic Relief (D4)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes [ ]	No [✓]	Depth (inches):
Water Table Present?	Yes [ ]	No [✓]	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes [ ]	No [✓]	Depth (inches):

Wetland Hydrology Present? Yes [ ] No [✓]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-G Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Ulmus Americana, American Elm	10	yes	facw
2.			
3.			
4.			
5.			
6.			
7.			
	10 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Digitaria sanguinalis, Crabgrass	30	yes	facu
2. Solidago Canadensis, Canada Goldenrod	30	yes	facu
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. Rubus occidentalis	10	no	upl
2. Celastrus scandens	50	yes	facu
3.			
4.			
	60 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	0	x 3 =	0
FACU species	110	x 4 =	440
UPL species	10	x 5 =	50
Column Totals:	130 (A)		510 (B)

Prevalence Index = B/A = 3.9

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-G Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 5/4	100					LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 10/1/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-H & I Wet

Investigator(s): C. Barron, M. Seifert Section, Township, Range: See Flag #s in Remarks

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.101284 Long: -71.569199 Datum: NAD83

Soil Map Unit Name: Whitman sandy loam, 0 to 3 percent slopes NWI classification: Not shown on NWI

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

-This datasheet reflects both HNTB-H and HNTB-I
-HNTB-I & HNTB-H connect via culvert(s) under roadway.
-Flag #s: HNTB-H-1 - HNTB-H-16, HNTB-I-1 - HNTB I-12
-3 culverts empty into HNTB-H -- Located at flag #s H-3, 5, & 10
-Culvert at H-10 nearly buried, with 3'x3' eroded hole filled with water at opening. Water appears to flow underground to drain into HNTB-H.
-Wetland includes small drainage channel located between flags H-9 & H-10 (includes upland island with knotweed, raspberry, multiflora rose, bittersweet)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☑ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☑ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☑	No ☐	Depth (inches): 4"
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water outside of wetland plot - unknown frog species present

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-H & I Wet

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Clethra alnifolia	45	Yes	FAC
2. Viburnum dentatum	15	Yes	FAC
3. Ilex verticillata	15	Yes	FACW
4.			
5.			
6.			
7.			
	75 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Phalaris arundinacea	75	Yes	FACW
2. Typha latifolia	15	No	OBL
3. Clethra alnifolia	15	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	105 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. Toxicodendron radicans	10	Yes	FAC
2.			
3.			
4.			
	10 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-H & I Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2"	10YR 2/1	100					Oa	Mostly decomposed
2-16"	10YR 2/1	80	10YR 5/1	20	D	M	CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☑ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐



Description: View of wetland HNTB-H datapoint.



Description: View of wetland HNTB-I near culvert at roadway.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 10/1/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-H & I Up

Investigator(s): C. Barron, M. Seifert Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.101254 Long: -71.569217 Datum: NAD83

Soil Map Unit Name: Whitman sandy loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

-This datasheet reflects both HNTB-H Up and HNTB-I Up

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-H & I Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Yes	FAC
2. Quercus rubra	25	Yes	FACU
3. Fraxinus americana	15	Yes	FACU
4.			
5.			
6.			
7.			
	70	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1. Clethra alnifolia	40	Yes	FAC
2. Viburnum dentatum	10	No	FAC
3. Quercus alba	10	No	FACU
4. Vaccinium corymbosum	10	No	FACW
5.			
6.			
7.			
	70	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Solidago canadensis	25	Yes	FACU
2. Phalaris arundinacea	20	Yes	FACW
3. Carex squarrosa	10	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	55	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1. Toxicodendron radicans	20	Yes	FAC
2. Parthenocissus quinquefolia	10	Yes	FACU
3.			
4.			
	30	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	30	x 2 =	60
FAC species	100	x 3 =	300
FACU species	85	x 4 =	340
UPL species	0	x 5 =	0
Column Totals:	225 (A)		710 (B)

Prevalence Index = B/A = 3.16

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-H & I Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1"	10YR 2/2	100					LS	
1-16"	10YR 3/3	100					LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock

Depth (inches): 12"

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 10/1/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-J WET

Investigator(s): C. Barron, M. Seifert Section, Township, Range: Flag #s: HNTB-J-1 - HNTB-J-11

Landform (hillslope, terrace, etc.): None Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.102238 Long: -71.569443 Datum: NAD83

Soil Map Unit Name: Whitman sandy loam, 0 to 3 percent slopes NWI classification: Not shown on NWI

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 2"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

-Low area adjacent to old rock wall

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-J WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Yes	FAC
2. Prunus serotina	20	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Ilex verticillata	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Matteuccia struthiopteris	30	Yes	FAC
2. Impatiens capensis	15	Yes	OBL
3. Cardamine hirsuta	10	No	FACU
4. Toxicodendron radicans	10	No	FAC
5. Arisaema triphyllum	5	No	FAC
6. Eurybia divaricata	5	No	--
7. Onoclea sensibilis	2	No	FACW
8.			
9.			
10.			
11.			
12.			
	77	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1. Parthenocissus quinquefolia	20	Yes	FACU
2. Smilax rotundifolia	10	Yes	FAC
3.			
4.			
	30	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 71% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-J WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8"	10YR 2/1	100					SIL	
8-16"	10YR 5/1	60					SIL	
	10YR 2/1	40						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:



Description: View of wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 10/1/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-J Up

Investigator(s): C. Barron, M. Seifert Section, Township, Range:

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.102374 Long: -71.569312 Datum: NAD83

Soil Map Unit Name: Whitman sandy loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	
Wetland Hydrology Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☑ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-J Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	60	Yes	FAC
2. Betula lenta	25	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	85	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Ilex verticillata	10	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Matteuccia struthiopteris	40	Yes	FAC
2. Pinus strobus	10	Yes	FACU
3. Berberis thunbergii	5	No	FACU
4. Aralia nudicaulis	5	No	FACU
5. Quercus alba	2	No	FACU
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	62	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1. Smilax rotundifolia	10	Yes	FAC
2.			
3.			
4.			
	10	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	110	x 3 =	330
FACU species	47	x 4 =	188
UPL species	0	x 5 =	0
Column Totals:	167 (A)		538 (B)

Prevalence Index = B/A = 3.22

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-J Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10"	10YR 2/1	100					silt loam	
10-14"	10YR 5/6	90	10YR 4/6	5	C	M	silt loam	
	10YR 2/1	5						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

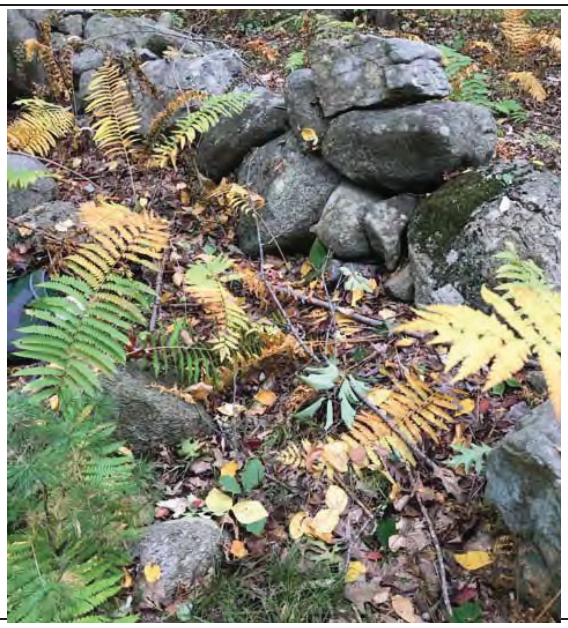
Restrictive Layer (if observed):

Type: rock

Depth (inches): 14"

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

Waters of the U.S. Data Sheet

Project: Mendon - Route 16		**Feature ID:** Muddy Brook
Date: 8/7/2020	**State:** MA	**Photos:** See attached
Crew: L. McDonald, M. Turgeon	**County:** Worcester	**Last Flag Number:** HNTB-Bank-1-9 (N of Rte 16) & HNTB-Bank-1-11 (S of Rte 16)

Feature Hydrologic Class (check one):

Tidal	Perennial	Intermittent	Ephemeral
TNW (Subject to ebb and flow)	TNW – Perennial (Flowing year round)	RPW – Seasonal (must flow at least 3 months a year)	Non-RPW draining uplands
	X RPW – Perennial (Flowing year round)		Non-RPW erosional feature
			Non-RPW with abutting wetland
			Non-RPW with adjacent wetland
Describe rational for hydrologic class: Observed flow. Muddy Brook flows southeast through large box culvert under Route 16.			Non-RPW wetland adjacent or abutting upstream (outside of study area)

Hydrologic Connectivity –	Upstream:Unknown	Downstream: Unknown	Adjacent/Abutting: Wetlands C, D, E

Feature Description: ***(check all that apply)***

Shape (with respect to OHW)			Substrate						Vegetation Cover Type (MBSS)
X	Natural Channel Shape	Width: 10-15 feet		Silts	X	Sands		Muck	RB: forested wetland
	Artificial (man-made)	Depth: 0-12"	X	Cobbles	X	Gravel		Other:	
	Manipulated (man-altered)	Bank Erosion/stability: Moderately eroded		Bedrock		Concrete			LB: forested wetland
	Other:		Side slope: ☐ ≥1:1 ☒ 2:1 ☒ 3:1 ☐ ≤4:1						
Notes: Adj veg includes red maple, skunk cabbage, sweet pepperbush, raspberry. Small intermittent stream along right bank within wetland D.									

Weather/Precipitation Conditions:

During Field Visit		Inches of Rain Within Last Week		Monthly Drought Condition NCDC Regional PDSI http://www.ncdc.noaa.gov/temp-and-precip/climatological-rankings/index.php **Month:** December **Year:** 2019												
X	No rain		0-0.5								X					
	Light rain		0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
	Heavy Rain	X	>1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet		

Non-tidal tributary has: (*check all that apply; include photos for each & list photo #)*

Bed and Banks		Ordinary High Water Mark							
X	Yes	X	Clear, natural line impressed on the bank	X	Sediment deposition	X	Sediment sorting
	No		Changes in the character of soil		Water staining	X	Scour
		X	Shelving	X	Presence of flood litter/debris	X	Observed/predicted flow events
			Vegetation matted down, bent, or absent		Destruction of terrestrial veg.		Abrupt change in plant community
			Leaf litter disturbed		Presence of wrack line		Other:

Tidal tributary has: (*check all that apply; include photos for each & list photo #)*

High Tide Line		Mean High Water Mark indicated by:		Chemical Characteristics	
	Oil or scum line along shore objects		Survey to available datum		Water is clear
	Fine shell or debris deposits (foreshore)		Physical markings		Water is discolored
	Physical markings/characteristics		Vegetation lines/changes in types		Oily film
	Tidal gauges				Other:
Notes:					

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Proposal No. 608491-131468



Photo 1: View of channel north of Route 16, facing upstream. Taken 8/7/2020.



Photo 2: View of channel and culvert north of Route 16, facing downstream. Taken 8/7/2020.



Photo 3: View of channel south of Route 16, facing upstream. Taken 8/7/2020.



Photo 4: View of channel south of Route 16, facing downstream. Taken 8/7/2020.

Waters of the U.S. Data Sheet

Project: Mendon - Route 16		**Feature ID:** Willow Brook
Date: 8/7/2020	**State:** MA	**Photos:** See attached
Crew: L. McDonald, M. Turgeon	**County:** Worcester	**Last Flag Number:** Flag #s HNTB-Bank-1 -- HNTB-Bank-10

Feature Hydrologic Class (check one):

Tidal	Perennial	Intermittent	Ephemeral
TNW (Subject to ebb and flow)	TNW – Perennial (Flowing year round)	X RPW – Seasonal (must flow at least 3 months a year)	Non-RPW draining uplands
	RPW – Perennial (Flowing year round)		Non-RPW erosional feature
			Non-RPW with abutting wetland
			Non-RPW with adjacent wetland
Describe rational for hydrologic class: Observed flow. Willow Brook flows through culvert under Route 16			Non-RPW wetland adjacent or abutting upstream (outside of study area)

Hydrologic Connectivity –	Upstream:Unknown	Downstream: Unknown	Adjacent/Abutting: Wetland F

Feature Description: ***(check all that apply)***

Shape (with respect to OHW)			Substrate						Vegetation Cover Type (MBSS)
X	Natural Channel Shape	Width: 8 feet		Silts	X	Sands	X	Muck	RB: forested wetland & upland area
	Artificial (man-made)	Depth: 0-12"		Cobbles	X	Gravel		Other:	LB: forested wetland & upland area
X	Manipulated (man-altered)	Bank Erosion/stability: Moderately stable		Bedrock		Concrete			
	Other:		Side slope: ☐ ≥1:1 ☒ 2:1 ☒ 3:1 ☐ ≤4:1						
Notes: N of Route 16 -- Wier structure 15' from culvert.; S of Rte 16 to Maple Street - Stone walls on both banks; S of Maple St (outside study area) -- steep natural slopes									

Weather/Precipitation Conditions:

During Field Visit		Inches of Rain Within Last Week		Monthly Drought Condition NCDC Regional PDSI http://www.ncdc.noaa.gov/temp-and-precip/climatological-rankings/index.php **Month:** July **Year:** 2020												
X	No rain		0-0.5								X					
	Light rain		0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
	Heavy Rain	X	>1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet		

Non-tidal tributary has: (*check all that apply; include photos for each & list photo #)*

Bed and Banks		Ordinary High Water Mark							
X	Yes	X	Clear, natural line impressed on the bank	X	Sediment deposition		Sediment sorting
	No		Changes in the character of soil	X	Water staining	X	Scour
		X	Shelving		Presence of flood litter/debris	X	Observed/predicted flow events
			Vegetation matted down, bent, or absent		Destruction of terrestrial veg.		Abrupt change in plant community
			Leaf litter disturbed		Presence of wrack line		Other:

Tidal tributary has: (*check all that apply; include photos for each & list photo #)*

High Tide Line		Mean High Water Mark indicated by:		Chemical Characteristics	
	Oil or scum line along shore objects		Survey to available datum		Water is clear
	Fine shell or debris deposits (foreshore)		Physical markings		Water is discolored
	Physical markings/characteristics		Vegetation lines/changes in types		Oily film
	Tidal gauges				Other:
Notes:					

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Proposal No. 608491-131468



Photo 1: View of channel north of Route 16, facing upstream. Taken 8/7/2020.

Appendix C – Project Design Plans

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	38
PROJECT FILE NO.	608491		

TITLE SHEET & INDEX

PLAN AND PROFILE OF

UXBRIDGE ROAD, HASTINGS STREET, MILFORD STREET (ROUTE 16)

IN THE TOWN OF

MENDON

WORCESTER COUNTY

FEDERAL AID PROJECT NO.

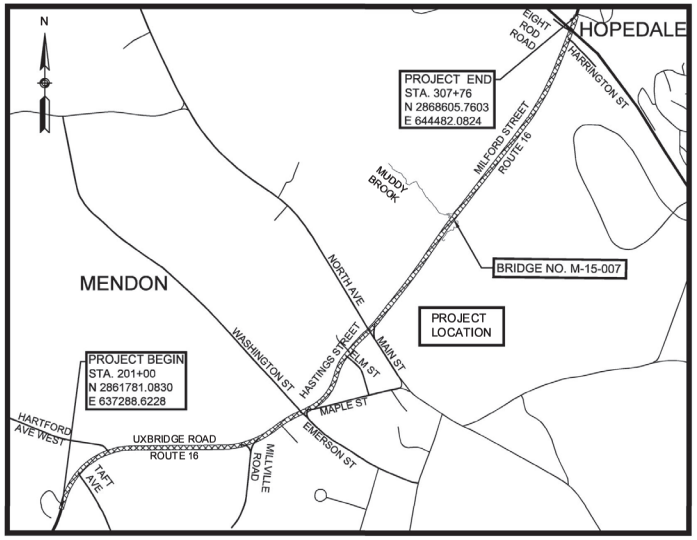
USACE PCN PLANS

THESE PLANS ARE SUPPLEMENTED BY THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK.

608491 EV1\TITLE & INDEX.DWG Plotted on 15-Aug-2024 3:08 PM

INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET & INDEX
2	LEGEND & ABBREVIATIONS
3	GENERAL NOTES
4	KEY PLAN
5 - 25	CONSTRUCTION PLANS
26 - 28	CULVERT FLOOD SECTIONS
29 - 33	CULVERT PLANS
34	CONTROL OF WATER PLAN
35 - 38	CONSTRUCTION DETAILS



0 800 1600 2400 3200

SCALE: 1" = 800'

LENGTH OF PROJECT = 10,676.00 FEET = 2.022 MILES

DESIGN DESIGNATION (ROUTE 16)

DESIGN SPEED	STATION
45 MPH	STA. 201+00 TO STA. 239+00
40 MPH	STA. 239+00 TO STA. 261+00
50 MPH	STA. 261+00 TO STA. 301+00
45 MPH	STA. 301+00 TO STA. 307+75
ADT (2019)	18,300
ADT (2031)	19,300
K	8.0%
D	75.0% EB
T (PEAK HOUR)	3.2%
T (AVERAGE DAY)	2.9%
DHV	1,534
DDHV	1,145 EB
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL

COMMONWEALTH OF MASSACHUSETTS
JAMES T. BARNACK
CIVIL
No. 50900
REGISTERED PROFESSIONAL ENGINEER
12/17/2024

DATE	DESCRIPTION	REV #
08/23/24	PS&E DESIGN SUBMISSION	0
02/23/24	100% DESIGN SUBMISSION	0
03/17/23	75% DESIGN SUBMISSION	0
07/30/21	25% DESIGN SUBMISSION	0

MassDOT Massachusetts Department of Transportation Highway Division

HNTB
31 ST. JAMES AVE SUITE 300
BOSTON, MA 02116

APPROVED

CHIEF ENGINEER DATE

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
CO. BD.		HYDRANT
		LIGHT POLE
		COUNTY BOUND
		GPS POINT
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
MON		WATER MANHOLE
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
TB		MONUMENT
		STONE BOUND
		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UPL	UPL	UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		TREE PROTECTION
PM	PM	SWAMP / MARSH
WG	WG	WATER GATE
		PARKING METER
100 99		OVERHEAD CABLE/WIRE
100 99		CURBING
		CONTOURS (ON-THE-GROUND SURVEY DATA)
		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT CONTROL BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT BUFFER ZONE
		200 FT RIVERFRONT AREA
		LIMIT OF BORDERING LAND SUBJECTED TO FLOOD (BLSF)
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING (REM)	PROPOSED	DESCRIPTION
	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR
		VIDEO DETECTION ZONE
		VIDEO DETECTION CAMERA
		PEDESTRIAN PUSH BUTTON, SIGN, AND SADDLE
		EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		PEDESTRIAN SIGNAL HEAD
		SIGNAL POST AND BASE
		MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		SPAN POLE
		SIGN AND POST
		SIGN AND POST (2 POSTS)
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE (12"/24" WIDE)
	CW	CROSSWALK (12" WIDE)
	SWL	SOLID WHITE LINE (6" WIDE)
	SYL	SOLID YELLOW LINE (6" WIDE)
	BWL	BROKEN WHITE LINE (6" WIDE)
	BYL	BROKEN YELLOW LINE (6" WIDE)
	DWL	DOTTED WHITE LINE (6" WIDE, 3' LINE SEGMENT, 9' BREAKS)
	DYL	DOTTED YELLOW LINE (6" WIDE, 3' LINE SEGMENT, 9' BREAKS)
	DWLEx	DOTTED WHITE LINE EXTENSION (6" WIDE, 2' LINE SEGMENT, 6' BREAKS)
	DYLEx	DOTTED YELLOW LINE EXTENSION (6" WIDE, 2' LINE SEGMENT, 6' BREAKS)
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE
	YL	YIELD LINE
		BIKE LANE MARKING
		BIKE DETECTOR MARKING
		SHARED USE LANE MARKING
		1-WAY WHITE SLOTTED PAVEMENT MARKER
		2-WAY YELLOWYELLOW SLOTTED PAVEMENT MARKER
		1-WAY YELLOW SLOTTED PAVEMENT MARKER

ALL PAVEMENT MARKINGS SHALL BE RECESSED POLYUREA UNLESS OTHERWISE SPECIFIED.

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ECCEN	ECCENTRIC
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
ER	EASTERN REDBUD
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
JCT	JUNCTION
L	LENGTH OF CURVE
LSA	LANDSCAPE AREA
LB	LEACH BASIN
LD	LONDON PLANETREE
LP	LIGHT POLE
LT	LEFT
LST	LOW SEATED TIMBER
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
NTS	NOT TO SCALE
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PCR	PEDESTRIAN CURB RAMP
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	38
PROJECT FILE NO.	608491		

LEGEND & ABBREVIATIONS

ABBREVIATIONS (cont.)

GENERAL

POT	POINT ON TANGENT
PRC	POINT ON REVERSE CURVE
PROJ	PROJECT
PROP	PROPOSED
PSB	PORTABLE SOIL BORROW
PT	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PVMT	PAVEMENT
PWW	PAVED WATERWAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SUP	SHARED USE PATH
SW	SIDEWALK
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TP	TREE PROTECTION
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

TRAFFIC SIGNAL ABBREVIATIONS

CAB	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY UPRAISED HAND
FDW	FLASHING UPRAISED HAND
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR YELLOW
FYL	FLASHING YELLOW LEFT ARROW
FYR	FLASHING YELLOW RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALKING PERSON
Y	STEADY CIRCULAR YELLOW
YL	STEADY YELLOW LEFT ARROW

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GENERAL NOTES

1. THIS BASEMAPPING WAS PREPARED BY NITSCH ENGINEERING IN JULY-SEPTEMBER, 2018, UTILIZING VARIOUS SURVEY EQUIPMENT TO INCLUDE LEICA TPS 1200 TOTAL STATION, LEICA GS14 GPS AND TERRESTRIAL MOBILE LIDAR. FIELD UPDATES AND ADDITIONAL TOPOGRAHIC DATA WAS COLLECTED IN OCTOBER 2020.

2. WETLANDS WERE DELINEATED BY HNTB IN ACCORDANCE WITH THE 1987 UNITED STATES ARMY CORPS OF ENGINEERS WETLAND DELINEATION MANUAL BETWEEN AUGUST 7, 2020 AND OCTOBER 1, 2020, AND VERIFIED ON OCTOBER 4, 2023. WETLAND FLAGS WERE LOCATED BY HNTB UTILIZING EOS ARROW 100 GNSS GPS UNIT WITH SUBMETER ACCURACY.

3. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXISTING GRADES AND ELEVATIONS. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY GRADE DISCREPANCIES PRIOR TO CONSTRUCTION.

4. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION.

5. PEDESTRIAN AND VEHICLE ACCESS TO ABUTTING PREMISES WILL BE MAINTAINED AT ALL TIMES AS DIRECTED BY THE ENGINEER. EMERGENCY VEHICLE ACCESS SHALL BE MAINTAINED AT ALL TIMES.

6. CONTRACTOR SHALL BE LIMITED TO CONSTRUCTION ACTIVITIES WITHIN THE IDENTIFIED LIMITS OF WORK AS SHOWN ON THE PLANS, OR AS DIRECTED TO DO SO BY THE ENGINEER.

7. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FROM THE TOWN AND APPLICABLE AGENCIES PRIOR TO COMMENCING WORK.

8. CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITY SERVICES AND HIGHWAY LIGHTING THROUGHOUT CONSTRUCTION UNTIL AND UNLESS THEY ARE REPLACED PER THE CONTRACT.

9. ALL GRANITE CURB THAT IS REMOVED SHALL BE RESET OR DISCARDED AS REQUIRED BY THE ENGINEER. GRANITE CURB THAT IS TO BE RESET SHALL NOT BE RANDOMLY MIXED WITH NEW CURB, BUT SHALL BE RESET SO AS TO GIVE A UNIFORM APPEARANCE.

10. DEWATERING IS LIKELY TO BE REQUIRED AT THE MUDDY BROOK CULVERT EXTENSIONS AND WORK ON THE DRAINAGE IMPROVEMENTS. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EXTENT OF DEWATERING REQUIRED AND TO PROPOSE THE MOST APPROPRIATE METHODS AND MATERIALS FOR DEWATERING THAT WILL ULTIMATELY BE APPROVED BY THE MASSDOT PROJECT ENGINEER. PLANS AND CALCULATIONS FOR ALL WATER CONTROL MEASURES WILL BE DEVELOPED BY THE CONTRACTOR, STAMPED BY A PROFESSIONAL CIVIL ENGINEER REGISTERED IN THE COMMONWEALTH, AND SUBMITTED TO MASSDOT'S PROJECT ENGINEER FOR APPROVAL PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

11. ALL DEWATERING AND/OR PUMP-AROUND RELATED EARTHWORK WILL BE CONDUCTED IN SUCH A MANNER AS TO PREVENT POTENTIAL SILTATION AND CONTAMINATION OF THE WETLANDS AND WATERWAYS WITHIN THE PROJECT LIMITS. ANY PUMPING DISCHARGE WILL NOT BE ALLOWED TO ENTER DIRECTLY INTO STREAMS OR ADJACENT WETLAND RESOURCE AREAS. WATER FROM THE WORK AREA WILL BE PUMPED TO A SEDIMENT FILTER BAG, WHICH WILL BE PLACED IN AN UPLAND AREA AND ENCIRCLED WITH COMPOST FILTER TUBES OR STRAW WATTLES. DEWATERING WILL BE CAREFULLY MONITORED TO ENSURE THAT THE WATER IS NOT PUMPED FASTER THAN IT CAN BE TREATED AND WILL BE TIMED TO AVOID PERIODS OF HIGH FLOW. ALL FILTERED SEDIMENTS WILL BE REMOVED FROM THE PROJECT AREA AND DISPOSED OFF-SITE. ONCE ALL CONSTRUCTION IN DEWATERED AREAS IS COMPLETE, THE ENTIRE WATER CONTROL SYSTEM STRUCTURE WILL BE REMOVED FROM THE SITE.

12. CONTRACTOR TO REMOVE AND STACK EXIST TOWN OF MENDON BANNERS ON UTILITY POLES. CONTRACTOR TO LEAVE ALL BANNERS AND BRACKETS AT THE TOWN HIGHWAY DEPARTMENT, ADDRESS 66 PROVIDENCE ST. MENDON, MA. 01756

DRAINAGE NOTES

1. CONTRACTOR SHALL VERIFY THE LOCATION OF THE EXISTING DRAINAGE SYSTEMS THAT ARE SHOWN ON THE DRAINAGE PLANS. WHERE EXISTING DRAINAGE IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION, AND SIZE SHALL BE ACCURATELY DETERMINED AND THE CONTRACTOR SHALL CONFIRM WHETHER THE DRAINAGE SYSTEM IS STILL ACTIVE. THE INFORMATION SHALL BE FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT. ALL ACTIVE DRAINAGE SYSTEMS IN CONFLICT WITH THE PROPOSED WORK SHALL BE RELOCATED IN KIND IN SUCH A MANNER AS TO AVOID IMPACTS TO PROPOSED ITEMS AND UTILITIES AS WELL AS IMPACTS TO EXISTING ITEMS AND UTILITIES TO REMAIN. IF DRAINAGE SYSTEM IS FOUND TO BE INACTIVE IT SHALL BE REMOVED OR FILLED IN-PLACE PER THE APPROVAL OF THE ENGINEER.

2. NO EXISTING DRAINAGE SYSTEMS SHALL BE ABANDONED, PLUGGED OR REMOVED WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.

3. PRECAST DRAINAGE STRUCTURES SHALL COMPLY WITH ASTM C-478 (CIRCULAR MANHOLES AND CATCH BASINS) AND ASTM C-913 (RECTANGULAR MANHOLES AND CATCH BASINS) AND ALL APPLICABLE ASSOCIATED ASTM STANDARDS.

4. PRECAST CONCRETE RINGS OR NON-SHRINK GROUT SHALL BE USED FOR GRADE ADJUSTMENTS.

5. CONTRACTOR SHALL CLEAN AND MAKE FUNCTIONAL ALL EXISTING STRUCTURES AND PIPING WITHIN THE LIMIT OF WORK. ALL EXISTING AND/OR PROPOSED DRAINAGE STRUCTURES AND PIPES WITHIN THE LIMIT OF WORK SHALL AGAIN BE CLEANED PRIOR TO CONCLUSION OF THE CONTRACT.

6. SHOULD DAMAGE OF ANY KIND OCCUR TO EXISTING PIPES AND STRUCTURES, THE CONTRACTOR SHALL MAKE REPAIRS, AT HIS OR HER OWN EXPENSE, TO THE SATISFACTION OF THE ENGINEER AND UTILITY OWNER.

7. GRADING SHALL PROVIDE POSITIVE DRAINAGE TO ALL DRAIN INLET STRUCTURES.

8. DURING CONSTRUCTION, ALL STRUCTURES OF THE EXISTING SYSTEM AND NEW SYSTEM OF DRAINS SHALL BE PROTECTED AGAINST SEDIMENTATION AND DEBRIS.

9. ALL DRAINAGE STRUCTURES AND PIPING SHALL BE DESIGNED AND CONSTRUCTED TO WITHSTAND REQUIRED LOADING, AS SHOWN IN THE CONTRACT DOCUMENTS.

10. PROPOSED INVERTS ON PLANS ARE SHOWN FOR BIDDING PURPOSES ONLY. ACTUAL INVERT ELEVATIONS WILL BE CONFIRMED IN THE FIELD.

11. DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY, BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES THE ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY STRUCTURES BE ORDERED. ANY FIELD ADJUSTMENTS TO LINE & GRADE UP TO A DEPTH OF 5' SHALL BE INCLUDED IN THE COST OF THE PIPE. PIPE EXCAVATION GREATER THAN 5' WILL BE PAID UNDER CLASS B TRENCH EXCAVATION.

UTILITY NOTES

1. ALL UNDERGROUND UTILITIES AS SHOWN WERE COMPILED USING FIELD SURVEY INFORMATION AND AVAILABLE RECORD INFORMATION.

2. RECORD UTILITY INFORMATION FROM THE VARIOUS UTILITY COMPANIES AND PUBLIC AGENCIES, ARE APPROXIMATE ONLY AND ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD.

3. ALL UTILITY COMPANIES, PUBLIC AND PRIVATE MUST BE NOTIFIED, INCLUDING THOSE IN CONTROL OF UTILITIES NOT SHOWN ON THIS PLAN, (SEE CHAPTER 370, ACTS OF 1963, MASSACHUSETTS) PRIOR TO DESIGNING, EXCAVATING, BLASTING, INSTALLING, BACKFILLING, GRADING, PAVEMENT RESTORING OR REPAVING.

4. THE LOCATION OF EXISTING PIPES OR OTHER UNDERGROUND STRUCTURES OR PROPERTY LINES ARE NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL UNDERGROUND PIPES OR STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL CALL "DIG SAFE" (1-888-344-7233) 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS) PRIOR TO ANY EXCAVATION TO OBTAIN ACCURATE UTILITY LOCATIONS.

5. SUBSURFACE UTILITY LOCATIONS HAVE BEEN PLOTTED TO MEET UTILITY QUALITY LEVEL "C" AS DESCRIBED IN ASCE STANDARD 38-02 AND SUMMARIZED HERE. THE UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS BASED ON ABOVE-GROUND FIELD OBSERVATION AND EXISTING RECORD INFORMATION RECEIVED FROM UTILITY STAKE-HOLDERS.

6. IN ACCORDANCE WITH MGL CHAPTER 82, SECTION 40, 40A-40E INCLUDING AMENDMENTS, THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES, TOWN OF MENDON AND HOPEDALE, AND GOVERNMENT AGENCIES INCLUDED IN THIS PROJECT IN WRITING PRIOR TO ANY EXCAVATION WORK. CALL "DIG SAFE" AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK.

7. INVERTS SHOWN ON PLAN ARE NOT GUARANTEED TO BE ACCURATE, DUE TO THE LIMITATIONS OF FIELD OBSERVATION AND SURVEY TECHNIQUES THE INVERTS ARE SHOWN AS APPROXIMATE ONLY AND SHALL NOT BE WARRANTED TO BE CORRECT. ADDITIONAL FIELD INVESTIGATION IS NECESSARY WHERE ACCURATE MEASUREMENTS ARE REQUIRED FOR DESIGN OF CRITICAL AREAS.

8. THE EXISTING CONDITIONS PLAN IS TO BE USED FOR THE SPECIFIED PROJECT ONLY AND IS NOT WARRANTED TO BE COMPLETE FOR ANY OTHER FUTURE PROJECTS.

9. CONTRACTOR SHALL CONDUCT SUBSURFACE INVESTIGATIONS TO IDENTIFY GROUND WATER ELEVATION PRIOR TO CONSTRUCTION.

10. TREE TRIMMING AND SELECTIVE THINNING SHOULD OCCUR AT ANY NEW UTILITY POLE AND PROVIDE 10' CLEAR WIDTH OF ALL OVERHEAD WIRES (OHW). CONTRACTOR TO CONFIRM CLEARING AND TREE TRIMMING LIMITS TO MINIMIZE TRIMMING TO THE MAXIMUM EXTENT POSSIBLE. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.

SURVEY NOTES

1. THE HORIZONTAL DATUM SHOWN HEREON REFERENCES THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MAINLAND ZONE, NAD83(2011) EPOCH 2010.0 IN US SURVEY FOOT.

2. THE VERTICAL DATUM SHOWN HEREON REFERENCES NAVD88, GEOID 12B.

3. GROUND CONTROL PROVIDED BY MASSDOT.

4. ABUTTERS PROPERTY LINES DEPICTED HEREON ARE APPROXIMATE ONLY AND ARE BASED A COMPILATION OF RECORD DEEDS AND PLANS.

5. THE BASE PLAN WAS PREPARED WITHOUT THE BENEFIT OF A TITLE SEARCH AND MAY NOT DISCLOSE ANY MATTERS THAT MAY BE REVEALED BY ONE.

6. THE BASE PLAN DOES NOT SHOW UNWRITTEN OR UNRECORDED EASEMENTS WHICH MAY EXIST. A REASONABLE AND DILIGENT ATTEMPT HAS BEEN MADE TO OBSERVE ANY APPARENT AND VISIBLE USES OF THE LAND. THE BASE PLAN DOES NOT GUARANTEE THAT NO SUCH EASEMENTS EXIST.

7. LEGAL STATUS OF EASEMENTS, WAYS AND RESTRICTIONS NOT DETERMINED BY THE SURVEY.

8. TITLE TO LAND IN THE ABUTTING WAYS IS NOT SHOWN AND HAS NOT BEEN DETERMINED AS A RESULT OF THE SURVEY.

9. THE RIGHT-OF-WAY LINES AND BASELINES SHOWN ON THE BASE PLAN ARE BASED ON STATE HIGHWAY LAYOUTS. THE MONUMENTS FOUND MARKING THE LAYOUT PLAN WERE FIELD LOCATED AND USED TO ESTABLISH THE RIGHT-OF-WAY LINES UTILIZING A BEST FIT SOLUTION.

10. DASHED BUILDING LINES ARE FROM MASSGIS AND ARE SHOWN FOR GRAPHICAL REFERENCE ONLY.

TRAFFIC NOTES

1. THE MINIMUM MOUNTING HEIGHT OF POST-MOUNTED SIGNS, MEASURED VERTICALLY FROM THE BOTTOM OF THE SIGN TO THE TOP OF THE CURB OR SIDEWALK, OR THE ELEVATION OF THE NEAR EDGE OF THE TRAVELED WAY, SHALL BE 7 FEET NEAR SIDEWALK AND 8 FEET NEAR SHARED USE PATH UNLESS OTHERWISE SPECIFIED ON THE PLANS.

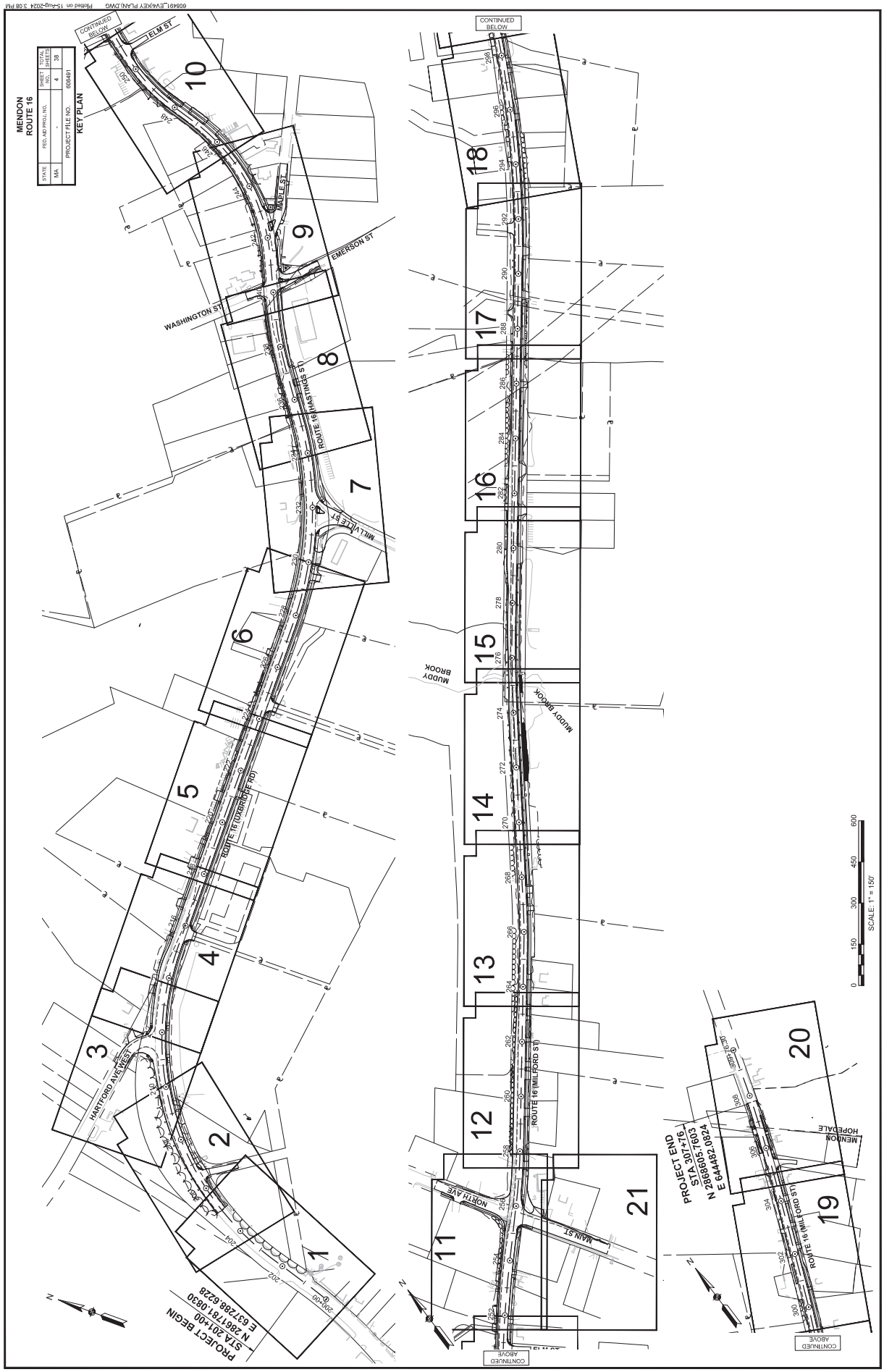
2. TRAFFIC SIGNAL CONDUIT SHALL BE 3" SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.

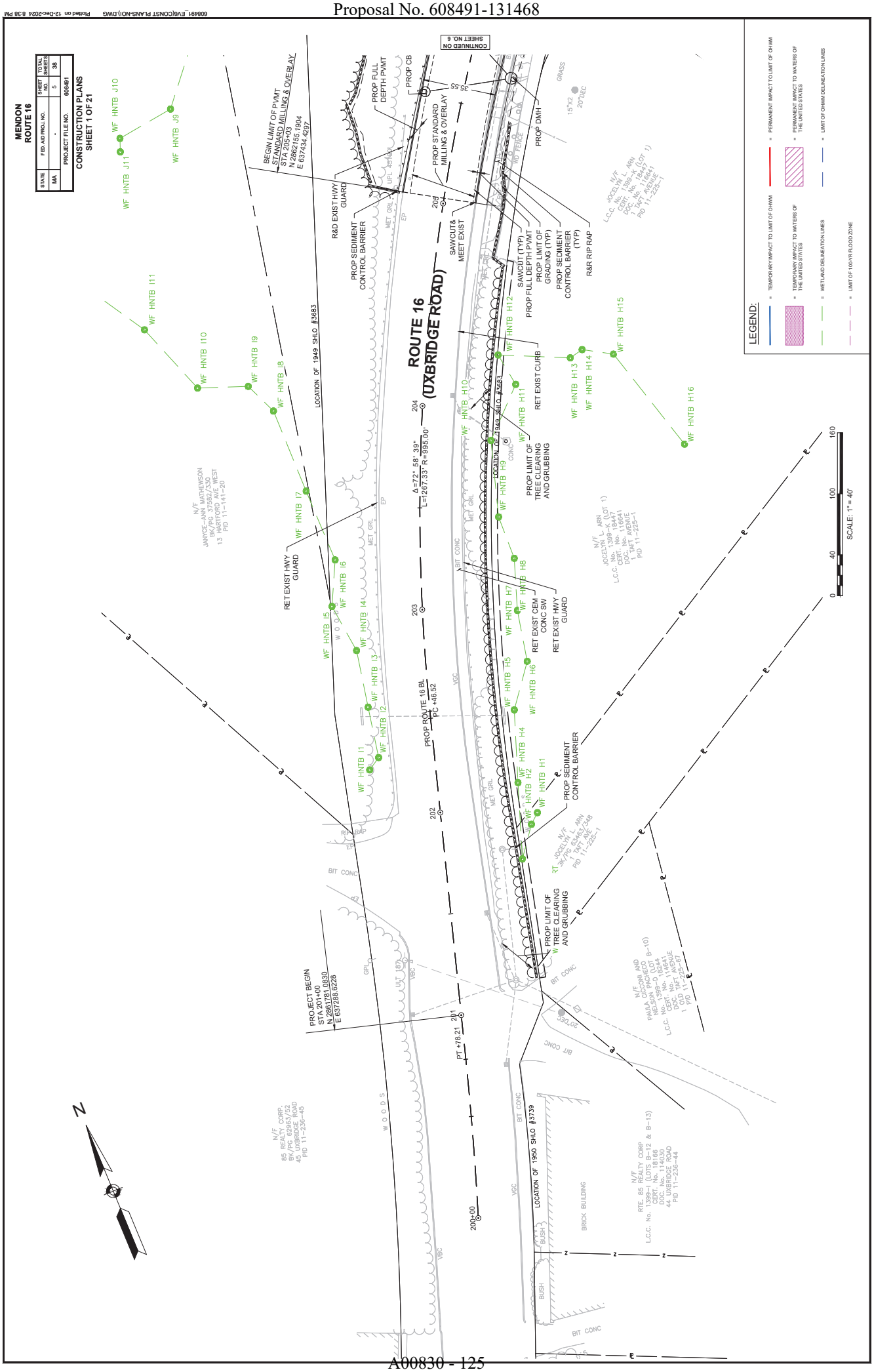
MENDON
ROUTE 16

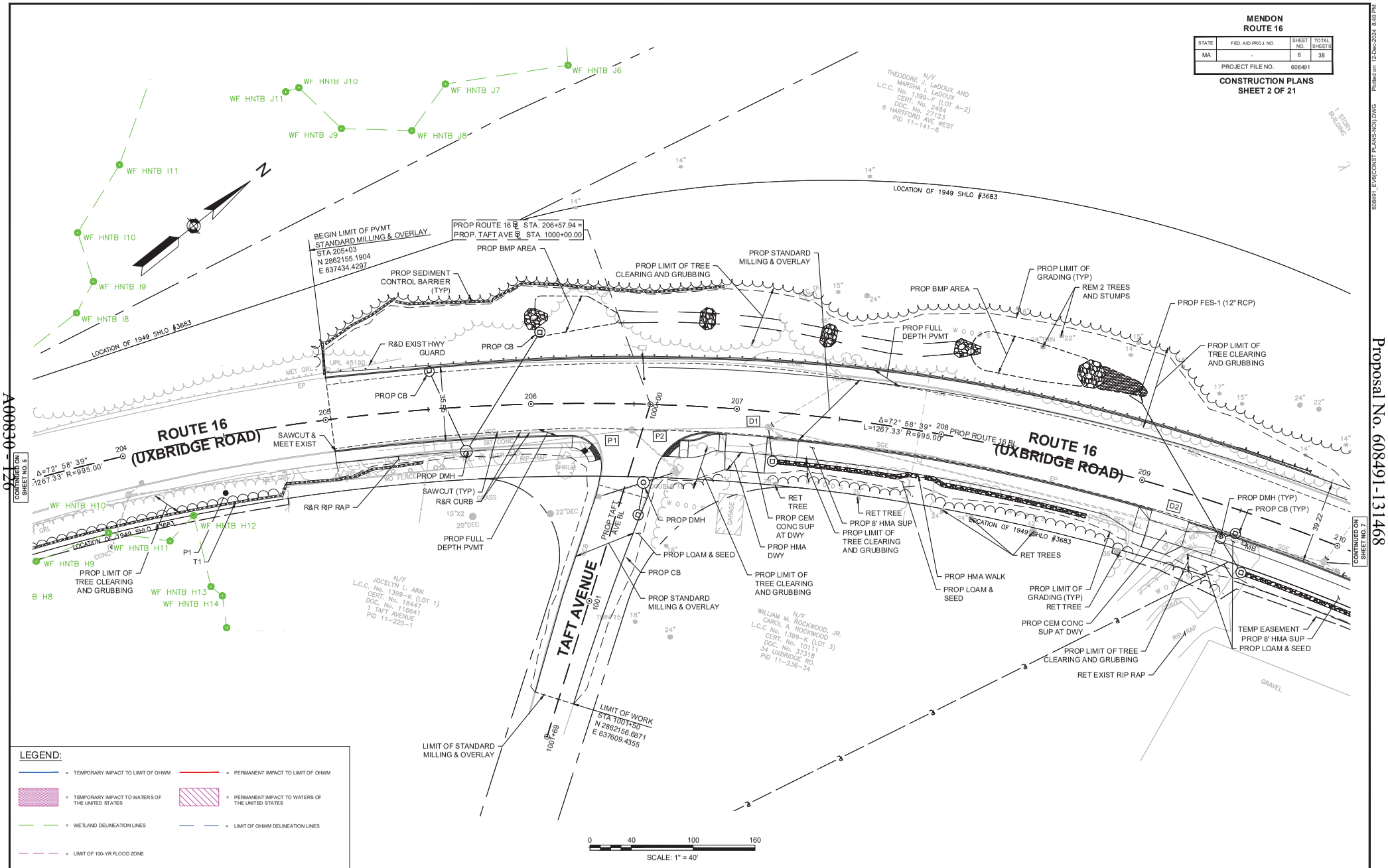
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	38
PROJECT FILE NO.	608491		

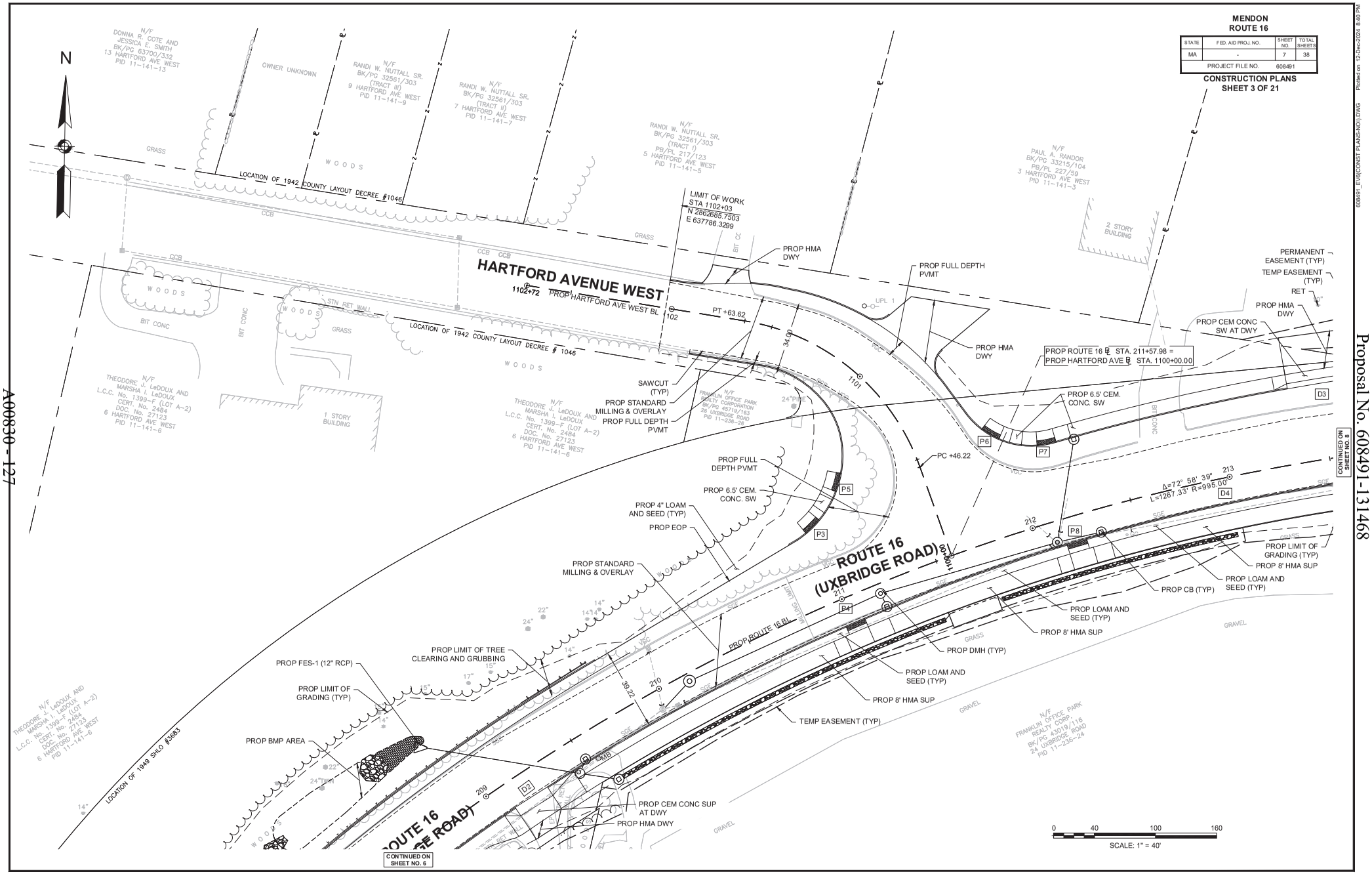
GENERAL NOTES

608491_EVG\GENERAL NOTES.DWG Plotted on 13-Aug-2024 3:38 PM

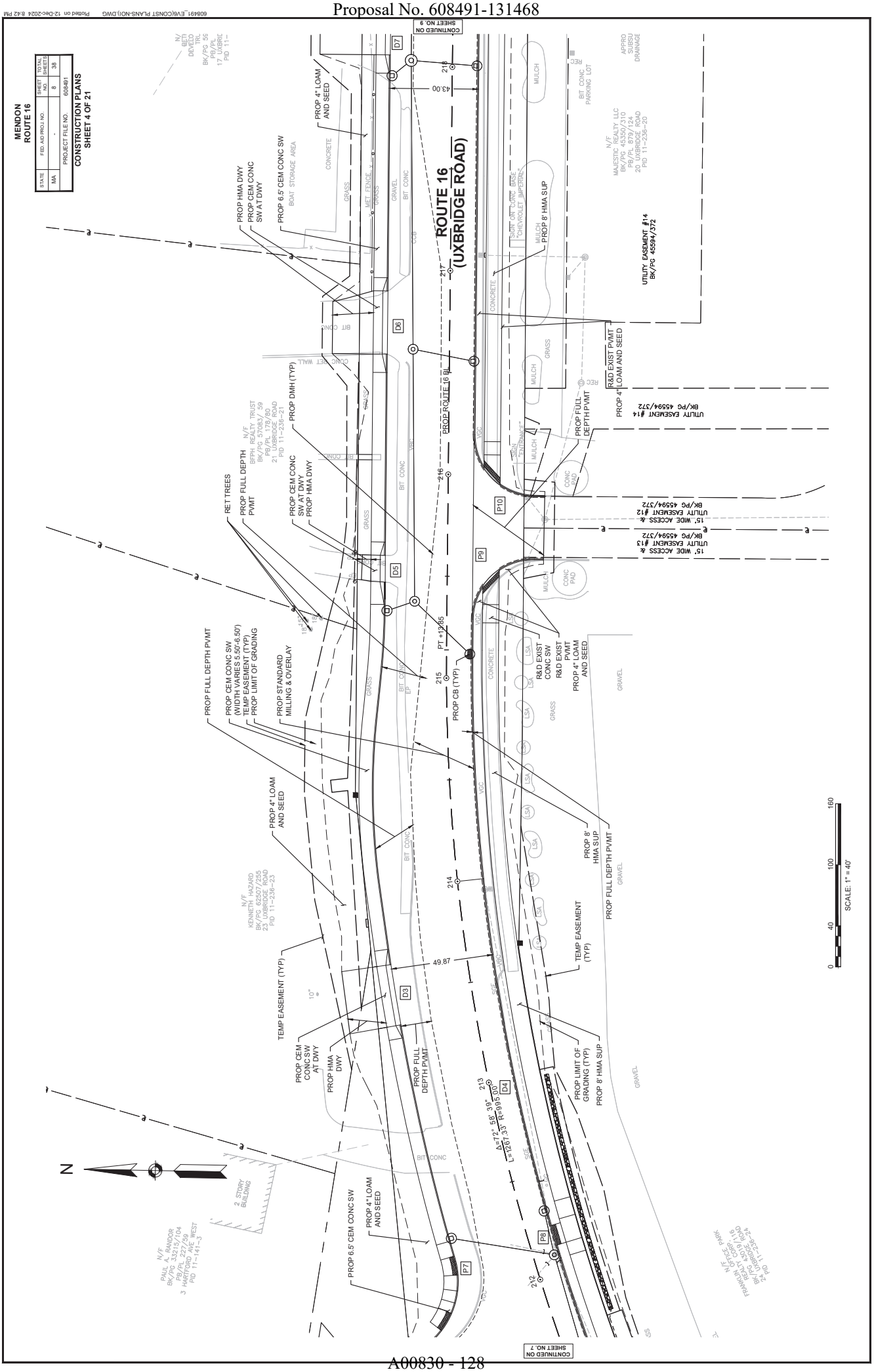

MENDON
ROUTE 16
KEY PLAN
STATE
MA
PROJECT FILE NO.
608491
FED. AID PROJ. NO.
-
SHEET NO.
4
TOTAL SHEETS
38
CONTINUED BELOW
CONTINUED ABOVE
ELM ST
MAPLE ST
EMERSON ST
WASHINGTON ST
ROUTE 16 (WASHINGTON ST)
MILLVILLE ST
ROUTE 16 (UXBRIDGE RD)
HARTFORD AVE WEST
MUDDY BROOK
NORTH AVE
MAIN ST
ROUTE 16 (MILFORD ST)
MENDON
HOPEDALE
PROJECT BEGIN
STA 201+00
N 2861181.0830
E 637288.6228
PROJECT END
STA 307+76
N 2868605.7603
E 644482.0824
SCALE: 1" = 150'
0
150
300
450
600

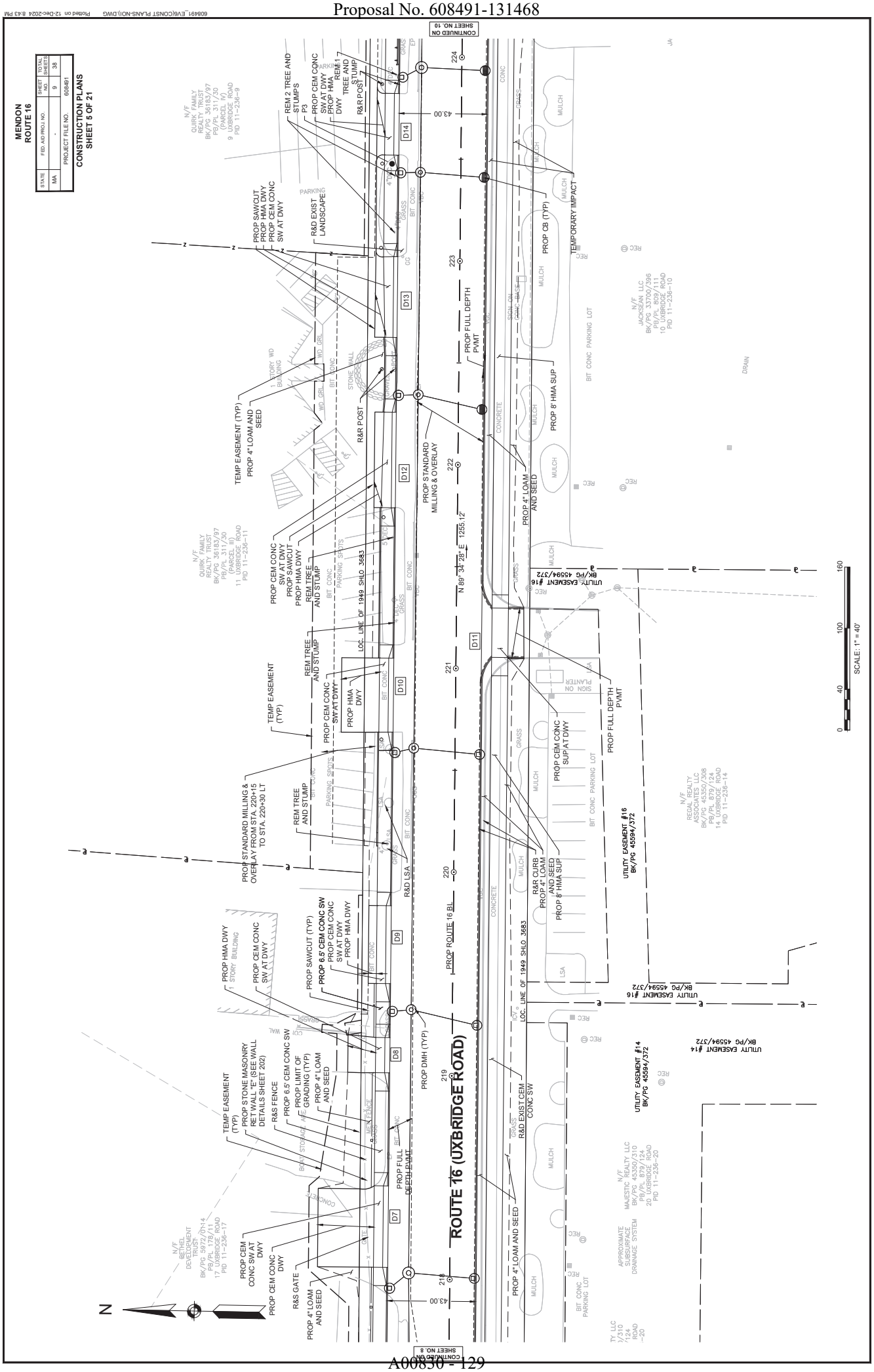

MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 1 OF 21
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608491
SHEET NO.
5
TOTAL SHEETS
38
ROUTE 16
(UXBRIDGE ROAD)
BEGIN LIMIT OF PVMT
STANDARD MILLING & OVERLAY
STA 205+03
N 2862165.1904
E 637434.4297
PROJECT BEGIN
STA 201+00
N 2861781.0830
E 637288.6226
PROP ROUTE 16 BL
PC +46.62
PT +78.21
Δ=72° 58' 39"
L=1267.33' R=995.00'
LOCATION OF 1949 SHLO #3683
LOCATION OF 1950 SHLO #3739
PROP FULL DEPTH PVMT
PROP CB
PROP STANDARD MILLING & OVERLAY
PROP DMH
R&D EXIST HWY GUARD
PROP SEDIMENT CONTROL BARRIER
SAWCUT & MEET EXIST
SAWCUT (TYP)
PROP FULL DEPTH PVMT
PROP LIMIT OF GRADING (TYP)
PROP SEDIMENT CONTROL BARRIER (TYP)
R&R RIP RAP
RET EXIST CURB
RET EXIST HWY GUARD
PROP LIMIT OF TREE CLEARING AND GRUBBING
RET EXIST CEM CONC SW
PROP SEDIMENT CONTROL BARRIER
PROP LIMIT OF TREE CLEARING AND GRUBBING
CONTINUED ON SHEET NO. 6
LEGEND:
= TEMPORARY IMPACT TO LIMIT OF OHWM
= TEMPORARY IMPACT TO WATERS OF THE UNITED STATES
= WETLAND DELINEATION LINES
= LIMIT OF 100-YR FLOOD ZONE
= PERMANENT IMPACT TO LIMIT OF OHWM
= PERMANENT IMPACT TO WATERS OF THE UNITED STATES
= LIMIT OF OHWM DELINEATION LINES
SCALE: 1" = 40'
N

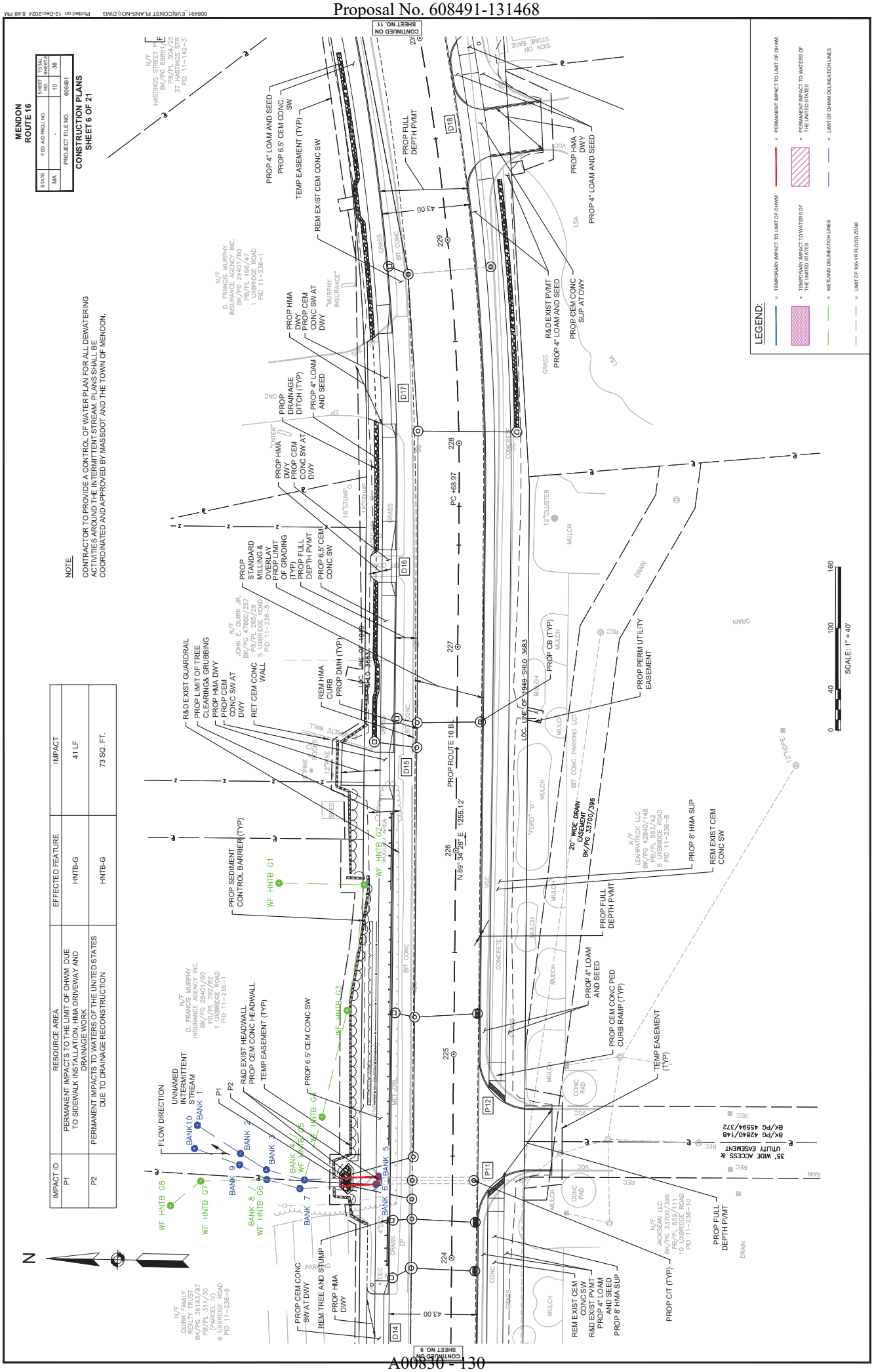

MENDON
ROUTE 16
STATE | FED. AID PROJ. NO. | SHEET NO. | TOTAL SHEETS
MA | - | 6 | 38
PROJECT FILE NO. 608491
CONSTRUCTION PLANS
SHEET 2 OF 21
ROUTE 16 (UXBRIDGE ROAD)
TAFT AVENUE
BEGIN LIMIT OF PVMT STANDARD MILLING & OVERLAY STA 205+03 N 2862155.1904 E 637434.4297
PROP ROUTE 16 ℄ STA. 206+57.94 = PROP. TAFT AVE ℄ STA. 1000+00.00
PROP BMP AREA
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP LIMIT OF TREE CLEARING AND GRUBBING
PROP STANDARD MILLING & OVERLAY
PROP LIMIT OF GRADING (TYP)
REM 2 TREES AND STUMPS
PROP FES-1 (12" RCP)
PROP FULL DEPTH PVMT
R&D EXIST HWY GUARD
PROP CB
SAWCUT & MEET EXIST
SAWCUT (TYP)
R&R CURB
R&R RIP RAP
PROP DMH
PROP FULL DEPTH PVMT
PROP TAFT AVE BL
PROP LOAM & SEED
PROP HMA DWY
PROP CEM CONC SUP AT DWY
RET TREE
PROP 8' HMA SUP
PROP HMA WALK
RET TREES
PROP DMH (TYP)
PROP CB (TYP)
TEMP EASEMENT
PROP 8' HMA SUP
PROP LOAM & SEED
RET EXIST RIP RAP
LIMIT OF WORK STA 1001+80 N 2862156.6871 E 637609.4355
LIMIT OF STANDARD MILLING & OVERLAY
LOCATION OF 1949 SHLO #3683
Δ=72° 58' 39" L=1267.33' R=995.00'
CONTINUED ON SHEET NO. 5
CONTINUED ON SHEET NO. 7
LEGEND:
= TEMPORARY IMPACT TO LIMIT OF OHWM
= PERMANENT IMPACT TO LIMIT OF OHWM
= TEMPORARY IMPACT TO WATERS OF THE UNITED STATES
= PERMANENT IMPACT TO WATERS OF THE UNITED STATES
= WETLAND DELINEATION LINES
= LIMIT OF OHWM DELINEATION LINES
= LIMIT OF 100-YR FLOOD ZONE
0 40 100 160
SCALE: 1" = 40'
608491_EVE(CONST PLANS-NOI).DWG
Plotted on 12-Dec-2024 8:40 PM
Proposal No. 608491-131468
A0008030-129

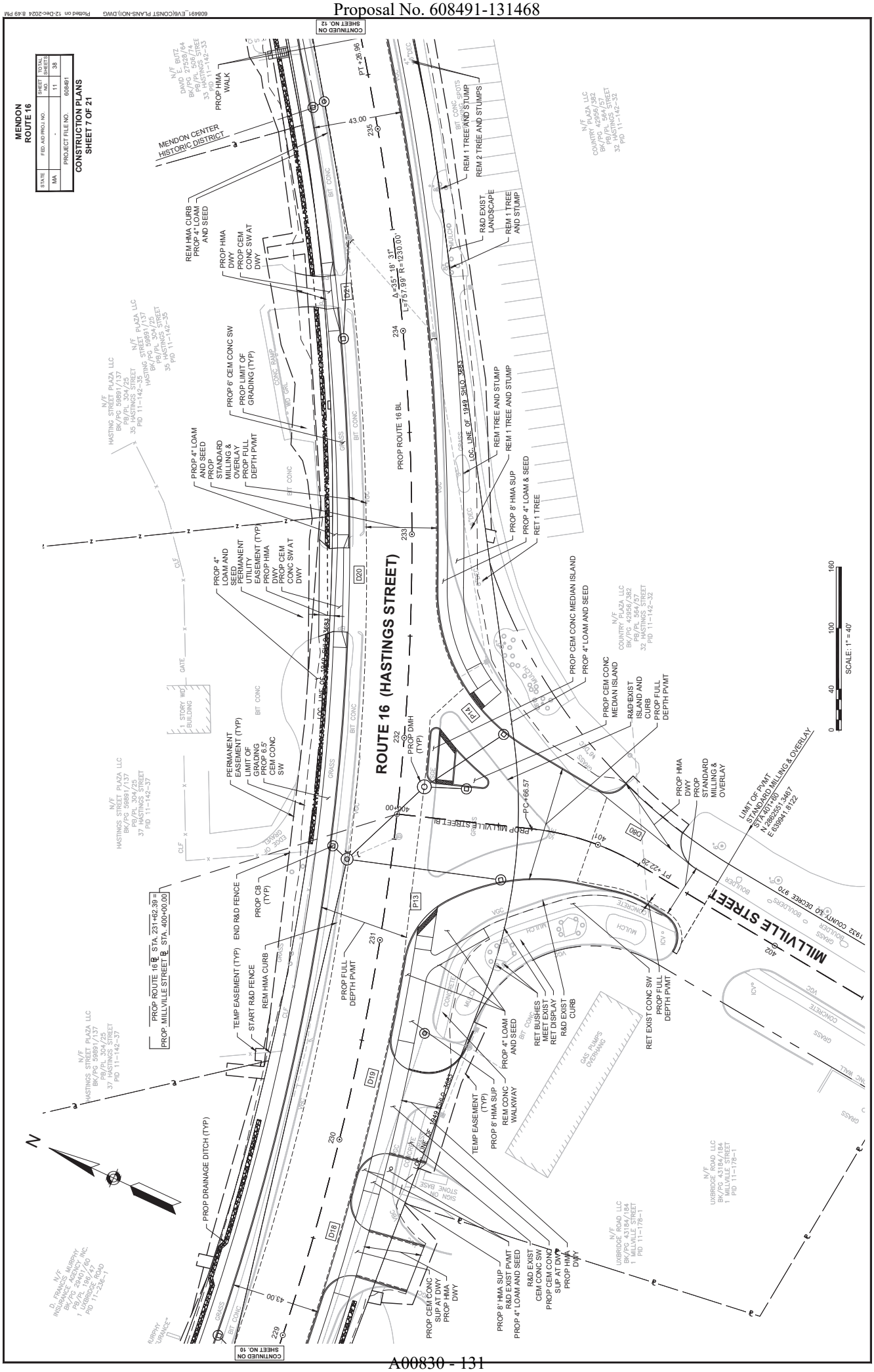


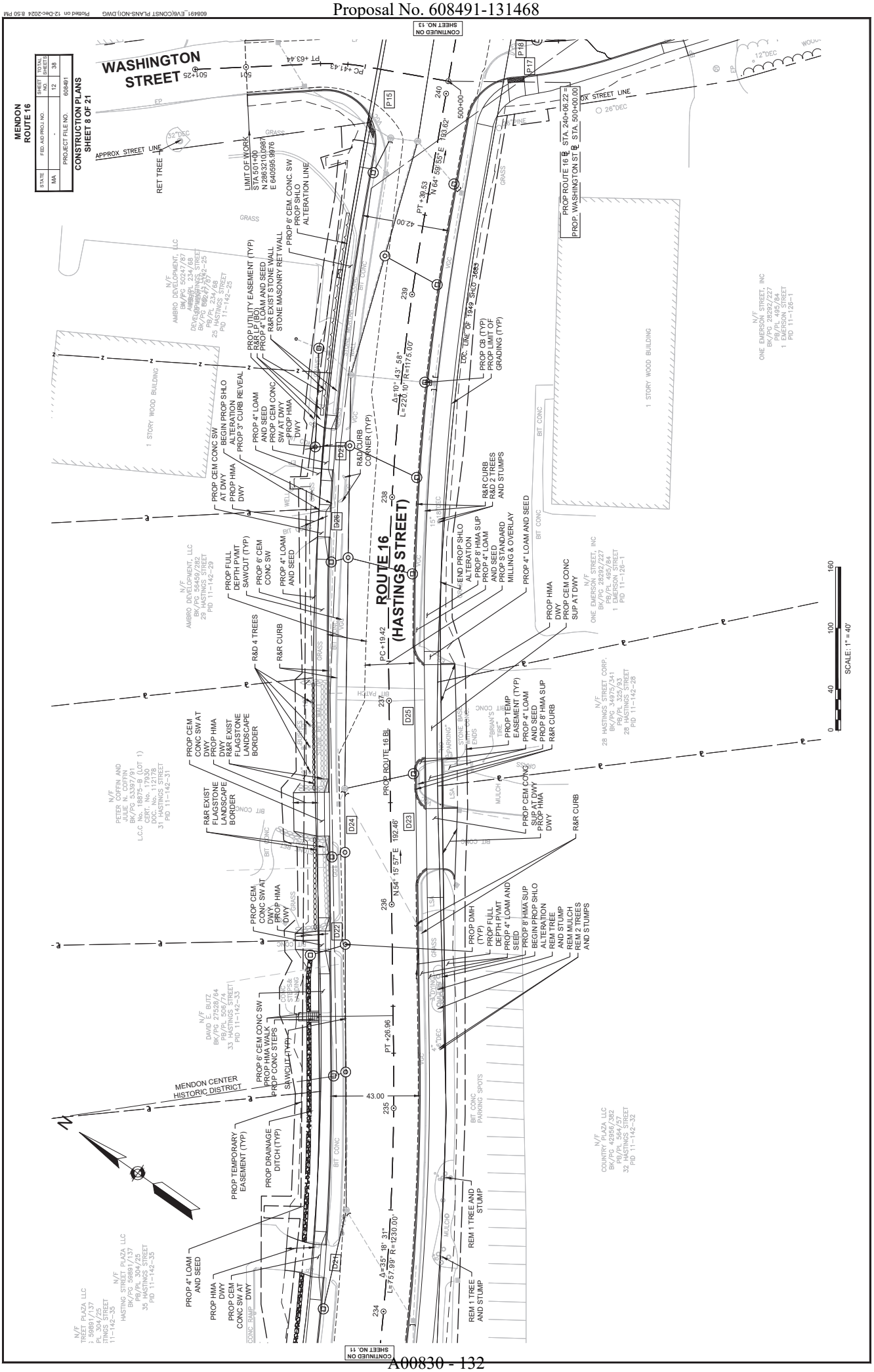
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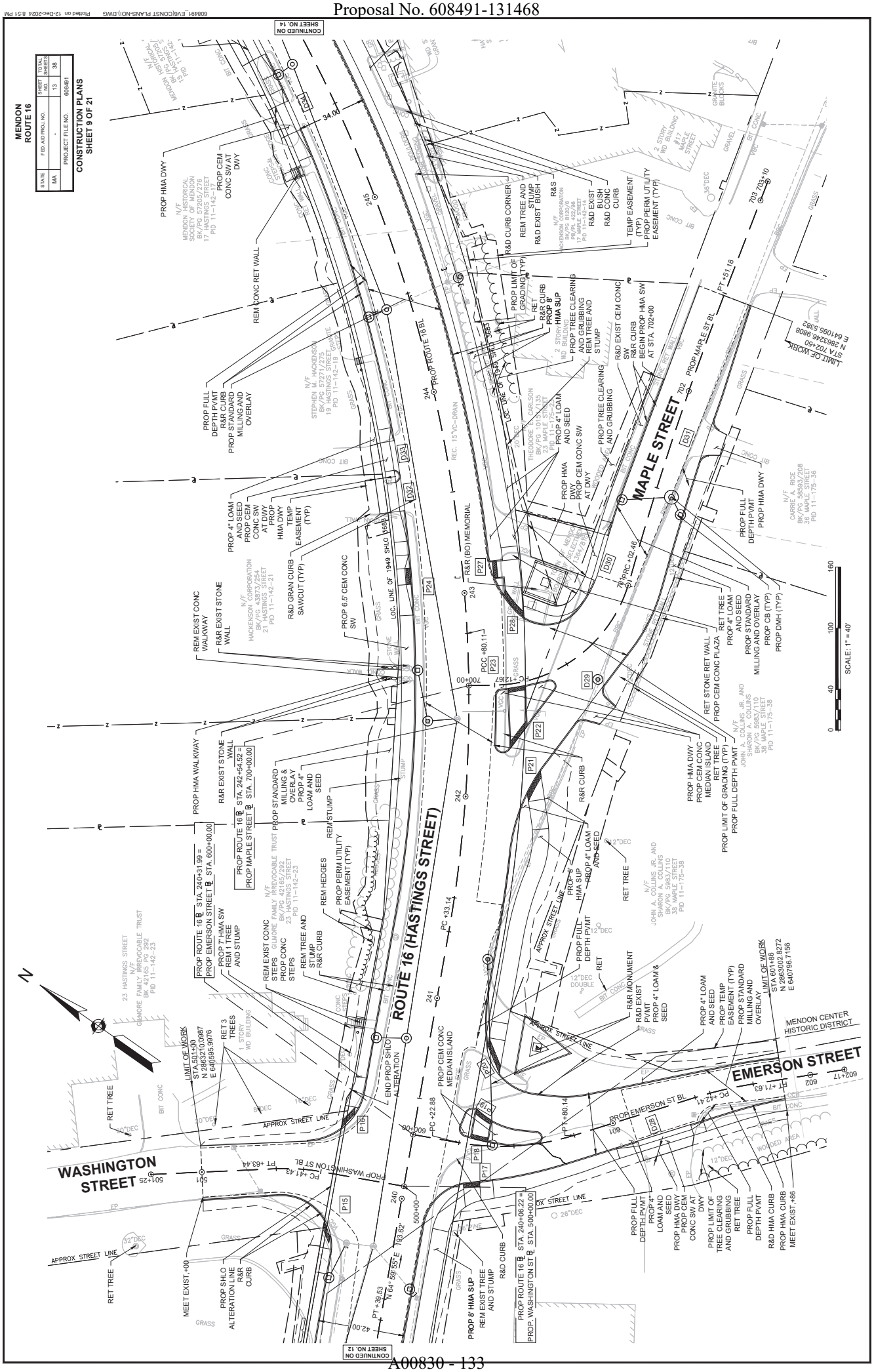

MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 4 OF 21
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA.
-
8
38
PROJECT FILE NO.
608491
ROUTE 16
(UXBRIDGE ROAD)
PROP ROUTE 16 BL
PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP 6.5' CEM CONC SW
PROP 8' HMA SUP
PROP FULL DEPTH PVMT
PROP CEM CONC SW (WIDTH VARIES 5.50'-6.50')
TEMP EASEMENT (TYP)
PROP LIMIT OF GRADING
PROP STANDARD MILLING & OVERLAY
PROP CB (TYP)
PT =13.85
R&D EXIST CONC SW
R&D EXIST PVMT
R&D EXIST PVMT AND SEED
PROP DMH (TYP)
RET TREES
PROP 8' HMA SUP
PROP FULL DEPTH PVMT
UTILITY EASEMENT #14
BK/PG 45594/372
15' WIDE ACCESS & UTILITY EASEMENT #12
BK/PG 45594/372
15' WIDE ACCESS & UTILITY EASEMENT #13
BK/PG 45594/372
TEMP EASEMENT (TYP)
PROP LIMIT OF GRADING (TYP)
PROP 8' HMA SUP
PROP 6.5' CEM CONC SW
PROP 4" LOAM AND SEED
L=120.33' R=995.00' Δ=7° 58' 38"
43.00
49.87
SCALE: 1" = 40'
CONTINUED ON SHEET NO. 9
CONTINUED ON SHEET NO. 7
N/F MAJESTIC REALTY, LLC BK/PG 45350/310 PB/PL 879/124 20 UXBRIDGE ROAD PID 11-236-20
N/F BFPH REALTY TRUST BK/PG 57083/69 PB/PL 1000/60 21 UXBRIDGE ROAD PID 11-236-21
N/F KENNETH HAZARD BK/PG 52627/295 23 UXBRIDGE ROAD PID 11-236-23
N/F PAUL A RANDOR BK/PG 33215/104 FB/PL 227/59 3 HAMPTON AVE WEST PID 11-141-3
N/F FRANKLIN CITY OF CSRE PARK BK/PG UNDOCKET 1019 ROAD PID 11-232-24
UTILITY EASEMENT #14 BK/PG 45594/372
2 STORY BUILDING
N

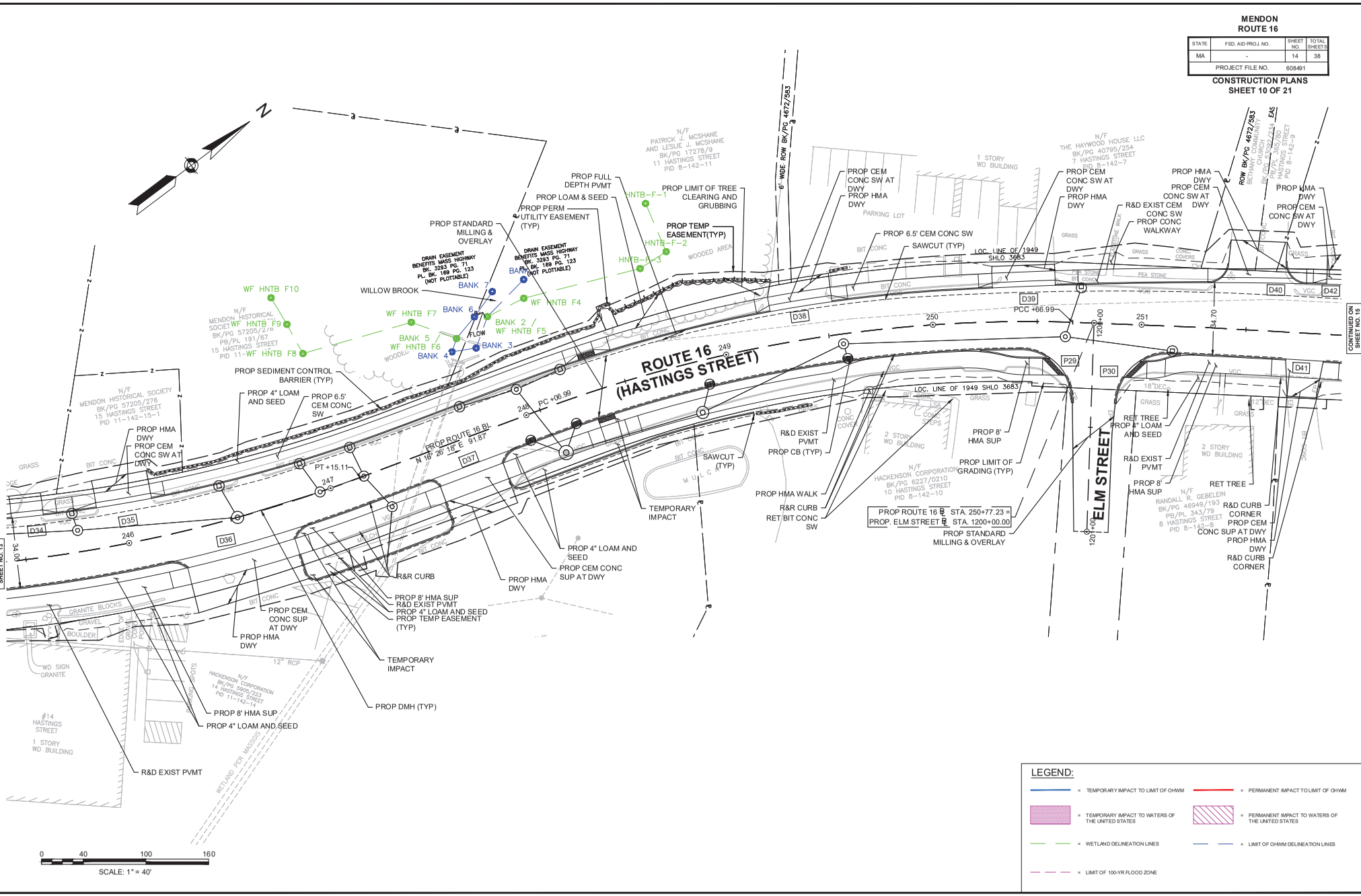

MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 5 OF 21
STATE: MA
FED. AID PROJ. NO.: -
PROJECT FILE NO.: 608491
SHEET NO.: 9
TOTAL SHEETS: 38
ROUTE 16 (UXBRIDGE ROAD)
PROP ROUTE 16 BL
LOC. LINE OF 1949 SHLO 3683
N 69° 34' 25" E 1255.12'
CONTINUED ON SHEET NO. 10
CONTINUED ON SHEET NO. 8
PROP STANDARD MILLING & OVERLAY FROM STA. 220+15 TO STA. 220+30 LT
PROP STANDARD MILLING & OVERLAY
PROP 6.5' CEM CONC SW
PROP STONE MASONRY RET WALL "E" (SEE WALL DETAILS SHEET 202)
PROP 8' HMA SUP
PROP FULL DEPTH PVMT
PROP CB (TYP)
PROP DMH (TYP)
PROP CEM CONC SW AT DWY
PROP HMA DWY
PROP SAWCUT (TYP)
PROP SAWCUT
PROP HMA DWY
PROP CEM CONC DWY
PROP 4' LOAM AND SEED
TEMP EASEMENT (TYP)
TEMP EASEMENT
R&S FENCE
R&S GATE
PROP LIMIT OF GRADING (TYP)
R&D LSA
R&D EXIST LANDSCAPE
R&D EXIST CEM CONC SW
R&R CURB
R&R POST
REM TREE AND STUMP
REM 2 TREE AND STUMPS
REM 17 TREE AND STUMP
TEMPORARY IMPACT
UTILITY EASEMENT #16 BK/PG 45594/372
UTILITY EASEMENT #14 BK/PG 45594/372
SCALE: 1" = 40'
N/F QUIRK FAMILY REALTY TRUST BK/PG 36183/97 PB/PL 311/30 PARCEL 1 9 UXBRIDGE ROAD PID 11-236-9
N/F QUIRK FAMILY REALTY TRUST BK/PG 36183/97 PB/PL 311/30 PARCEL 1 11 UXBRIDGE ROAD PID 11-236-11
N/F JACKSEAN LLC BK/PG 33700/396 PB/PL 809/111 10 UXBRIDGE ROAD PID 11-236-10
N/F REGAL REALTY ASSOCIATES LLC BK/PG 45350/308 PB/PL 879/124 14 UXBRIDGE ROAD PID 11-236-14
N/F MAJESTIC REALTY LLC BK/PG 45350/310 PB/PL 879/124 20 UXBRIDGE ROAD PID 11-236-20
N/F BETHEL DEVELOPMENT TRUST BK/PG 5972/0314 PB/PL 178/11 17 UXBRIDGE ROAD PID 11-236-17


MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 6 OF 21
STATE: MA
FED. AID PROJ. NO.: -
PROJECT FILE NO.: 608491
SHEET NO.: 10
TOTAL SHEETS: 38
NOTE:
CONTRACTOR TO PROVIDE A CONTROL OF WATER PLAN FOR ALL DEWATERING ACTIVITIES AROUND THE INTERMITTENT STREAM. PLANS SHALL BE COORDINATED AND APPROVED BY MASSDOT AND THE TOWN OF MENDON.
IMPACT ID | RESOURCE AREA | EFFECTED FEATURE | IMPACT
P1 | PERMANENT IMPACTS TO THE LIMIT OF OHWM DUE TO SIDEWALK INSTALLATION, HMA DRIVEWAY AND DRAINAGE WORK | HNTB-G | 41 LF
P2 | PERMANENT IMPACTS TO WATERS OF THE UNITED STATES DUE TO DRAINAGE RECONSTRUCTION | HNTB-G | 73 SQ. FT.
LEGEND:
= TEMPORARY IMPACT TO LIMIT OF OHWM
= PERMANENT IMPACT TO LIMIT OF OHWM
= TEMPORARY IMPACT TO WATERS OF THE UNITED STATES
= PERMANENT IMPACT TO WATERS OF THE UNITED STATES
= WETLAND DELINEATION LINES
= LIMIT OF OHWM DELINEATION LINES
= LIMIT OF 100-YR FLOOD ZONE
SCALE: 1" = 40'
N
FLOW DIRECTION
UNNAMED INTERMITTENT STREAM 1
BANK 1
BANK 2
BANK 3
BANK 4
BANK 5
BANK 6
BANK 7
BANK 8
BANK 9
BANK 10
P1
P2
P11
P12
WF HNTB G1
WF HNTB G2
WF HNTB G3
WF HNTB G4
WF HNTB G5
WF HNTB G6
WF HNTB G7
WF HNTB G8
PROP ROUTE 16 B
PC 468.97
N 89° 34' 28" E 1255.12'
LOC. LINE OF 1949 SURV. 3663
LOC. LINE OF 1949 SURV. 3663
20' WIDE DRAIN EASEMENT BK/PG 33700/396
35' WIDE ACCESS & UTILITY EASEMENT BK/PG 42840/148 BK/PG 45594/372
PROP 4" LOAM AND SEED PROP 6.5' CEM CONC. SW
TEMP EASEMENT (TYP)
REM EXIST CEM CONC SW
PROP FULL DEPTH PVMT
PROP HMA DWY
PROP 4" LOAM AND SEED
R&D EXIST PVMT PROP 4" LOAM AND SEED
PROP CEM CONC SUP AT DWY
PROP HMA DWY PROP CEM CONC SW AT DWY
PROP DRAINAGE DITCH (TYP)
PROP 4" LOAM AND SEED
PROP STANDARD MULCH & QUARRY PROP LIMIT OF GRADING (TYP)
PROP FULL DEPTH PVMT
PROP 6.5' CEM CONC SW
R&D EXIST GUARDRAIL
PROP LIMIT OF TREE CLEARING& GRUBBING
PROP HMA DWY
PROP CEM CONC SW AT DWY
RET CEM CONC WALL
REM HMA CURB
PROP DMH (TYP)
PROP CB (TYP)
PROP PERM UTILITY EASEMENT
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP 6.5' CEM CONC SW
R&D EXIST HEADWALL PROP CEM CONC HEADWALL
TEMP EASEMENT (TYP)
PROP 8' HMA SUP
REM EXIST CEM CONC SW
PROP FULL DEPTH PVMT
PROP 4" LOAM AND SEED
PROP CEM CONC PED CURB RAMP (TYP)
TEMP EASEMENT (TYP)
PROP CEM CONC SW AT DWY
REM TREE AND STUMP
PROP HMA DWY
REM EXIST CEM CONC SW
R&D EXIST PVMT PROP 4" LOAM AND SEED
PROP 8' HMA SUP
PROP CIT (TYP)
PROP FULL DEPTH PVMT
CONTINUED ON SHEET NO. 11
CONTINUED ON SHEET NO. 9
N/F HASTINGS STREET PLACE BK/PG 59891/ PB/PL 304/25 37 HASTINGS STR. PID 11-142-3
N/F D. FRANCIS MURPHY INSURANCE AGENCY, INC. BK/PG 29401/60 PB/PL 196/47 1 UXBRIDGE ROAD PID 11-236-1
N/F JOHN E. QUIRK JR. BK/PG 47850/257 PB/PL 265/29 5 UXBRIDGE ROAD PID 11-236-5
N/F D. FRANCIS MURPHY INSURANCE AGENCY, INC. BK/PG 29401/60 PB/PL 792/82 1 UXBRIDGE ROAD PID 11-236-1
N/F LEAHPATRICK, LLC BK/PG 42840/148 PB/PL 865/42 8 UXBRIDGE ROAD PID 11-236-8
N/F JACKSEAN LLC BK/PG 33700/396 PB/PL 809/111 10 UXBRIDGE ROAD PID 11-236-10
N/F QUIRK FAMILY REALTY TRUST BK/PG 36183/97 PB/PL 511/50 PB/PL 265/29 9 UXBRIDGE ROAD PID 11-236-9
"MURPHY INSURANCE"
"CENTER"
"CLUB"
"POND" "D"
12" CLUSTER
18" STUMP
12" TREE
12" HDPE
DRAIN
CONC PAD
MULCH
GRASS
BIT CONC
CONCRETE
VGC
REC
LSA
D14
D15
D16
D17
D18
224
225
226
227
228
229
43.00


MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 7 OF 21
STATE
MA.
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608491
SHEET NO.
11
TOTAL SHEETS
38
ROUTE 16 (HASTINGS STREET)
MILLVILLE STREET
MENDON CENTER HISTORIC DISTRICT
PROP ROUTE 16 BL
PROP MILLVILLE STREET BL STA. 400+00.00
PROP ROUTE 16 BL STA. 231+62.39
PC +66.57
PT +22.29
PT +26.96
PROP DMH (TYP)
PROP CB (TYP)
END R&D FENCE
TEMP EASEMENT (TYP)
START R&D FENCE
REM HMA CURB
PROP FULL DEPTH PVMT
PROP DRAINAGE DITCH (TYP)
PROP HMA WALK
REM HMA CURB PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP 6' CEM CONC SW
PROP LIMIT OF GRADING (TYP)
PROP 4" LOAM AND SEED PROP STANDARD MILLING & OVERLAY
PROP FULL DEPTH PVMT
PROP 4" LOAM AND SEED PERMANENT UTILITY EASEMENT (TYP)
PERMANENT EASEMENT (TYP)
LIMIT OF GRADING PROP 6.5' CEM CONC SW
PROP CEM CONC MEDIAN ISLAND
PROP 4" LOAM AND SEED
R&D EXIST ISLAND AND CURB
PROP 8" HMA SUP
REM CONC WALKWAY
RET BUSHES
MEET EXIST
RET DISPLAY
R&D EXIST CURB
RET EXIST CONC SW
PROP 4" LOAM AND SEED
PROP 8" HMA SUP
R&D EXIST PVMT
PROP 4" LOAM AND SEED
PROP CEM CONC SUP AT DWY
PROP HMA DWY
R&D EXIST CEM CONC SW
PROP CEM COND SUP AT DWY
PROP HMA DWY
REM TREE AND STUMP
REM 1 TREE AND STUMP
PROP 8" HMA SUP
PROP 4" LOAM & SEED
RET 1 TREE
REM 1 TREE AND STUMP
REM 2 TREE AND STUMPS
R&D EXIST LANDSCAPE
REM 1 TREE AND STUMP
LOC. LINE OF 1949 SHLO 3683
LIMIT OF PVMT STANDARD MILLING & OVERLAY
STA 401+80
N 2882351.3467
E 639941.8122
1932 COUNTY LO DECREE 970
A=35° 18' 31"
L=757.99' R=1230.00'
43.00
CONTINUED ON SHEET NO. 12
CONTINUED ON SHEET NO. 10
SCALE: 1" = 40'
0
40
100
160
N
N/F HASTINGS STREET PLAZA LLC BK/PG 59891/137 PB/PL 304/25 37 HASTINGS STREET PID 11-142-37
N/F HASTINGS STREET PLAZA LLC BK/PG 59891/137 PB/PL 304/25 35 HASTINGS STREET PID 11-142-35
N/F HASTINGS STREET PLAZA LLC BK/PG 59891/137 PB/PL 304/25 HASTINGS STREET PID 11-142-33
N/F E. BLITZ DAVID E. 21926/64 BK/PG 21926/74 PB/PL 306/74 35 HASTINGS STREET PID 11-142-33
N/F COUNTRY PLAZA LLC BK/PG 42956/382 BK/PG 564/57 32 HASTINGS STREET PID 11-142-32
N/F UXBRIDGE ROAD LLC BK/PG 43184/184 1 MILLVILLE STREET PID 11-178-1
N/F D. FRANCIS MURPHY INSURANCE AGENCY INC. BK/PG 28407/60 PB/PL 249/160 1 UXBRIDGE ROAD PID 11-236-1
1 STORY WD BUILDING
GAS PUMPS OVERHANG
CONCRETE
MULCH
GRASS
BOULDERS
BIT CONC
CONC RAMP
GATE
CLF
WD GRL
D18
D19
D20
D21
D90
P13
P14


MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 8 OF 21
STATE
FED. AID PROJ. NO.
PROJECT FILE NO. 608491
SHEET NO. 12
TOTAL SHEETS 38
WASHINGTON STREET
ROUTE 16
(HASTINGS STREET)
PROP ROUTE 16 BL
PROP ROUTE 16 EL STA. 240+06.22 =
PROP. WASHINGTON ST @ STA. 500+00.00
LIMIT OF WORK
STA 501+00
N 2863210.0987
E 640595.9976
PC +19.42
PT +26.96
PC +41.43
PT +63.44
PT +38.53
N 64° 59' 55" E
193.62'
N 54° 15' 57" E
192.46'
Δ=10° 43' 58"
L=221.10' R=1175.00'
Δ=35° 18' 31"
L=757.99' R=1230.00'
43.00
42.00'
CONTINUED ON SHEET NO. 13
CONTINUED ON SHEET NO. 11
MENDON CENTER HISTORIC DISTRICT
1 STORY WOOD BUILDING
PROP 6' CEM. CONC. SW
PROP SHLO ALTERATION LINE
PROP UTILITY EASEMENT (TYP)
R&R LP (BD)
PROP 4" LOAM AND SEED
R&R EXIST STONE WALL
STONE MASONRY RET WALL
PROP CB (TYP)
PROP LIMIT OF GRADING (TYP)
PROP CEM CONC SW
BEGIN PROP SHLO ALTERATION
PROP 3' CURB REVEAL
PROP 4" LOAM AND SEED
PROP CEM CONC SW AT DWY
PROP HMA DWY
R&D CURB CORNER (TYP)
R&R CURB
R&D 2 TREES AND STUMPS
END PROP SHLO ALTERATION
PROP 8" HMA SUP
PROP STANDARD MILLING & OVERLAY
PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SUP AT DWY
PROP FULL DEPTH PVMT SAWCUT (TYP)
PROP 6' CEM CONC SW
R&D 4 TREES
PROP TEMP PAVEMENT (TYP)
PROP 4" LOAM AND SEED
PROP 8" HMA SUP
R&R EXIST FLAGSTONE LANDSCAPE BORDER
PROP CEM CONC SW AT DWY
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP HMA DWY
PROP 8" CEM CONC SW
PROP HMA WALK
PROP CONC STEPS
SAWCUT (TYP)
PROP DMH (TYP)
PROP FULL DEPTH PVMT
PROP 4" LOAM AND SEED
PROP 8" HMA SUP
BEGIN PROP SHLO ALTERATION
REM TREE AND STUMP
REM MULCH
REM 2 TREES AND STUMPS
PROP TEMPORARY EASEMENT (TYP)
PROP DRAINAGE DITCH (TYP)
REM 1 TREE AND STUMP
PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SW AT DWY
N/F AMBRO DEVELOPMENT, LLC BK/PG 50247/87 AMBRO DEVELOPMENT, LLC BK/PG 50247/87 PB/PL 234/68 25 HASTINGS STREET PID 11-142-25
N/F PETER COFFIN AND JULIE N. COFFIN BK/PG 53397/61 L.C.C. No. 18578-B (LOT 1) CERT. No. 17930 DOC. No. 112178 31 HASTINGS STREET PID 11-142-31
N/F DAVID E. BUTZ BK/PG 27528/64 PB/PL 686/274 33 HASTINGS STREET PID 11-142-33
N/F HASTING STREET PLAZA LLC BK/PG 59881/137 PB/PL 304/25 35 HASTINGS STREET PID 11-142-35
N/F 28 HASTINGS STREET CORP. BK/PG 34975/341 PB/PL 325/93 28 HASTINGS STREET PID 11-142-28
N/F COUNTRY PLAZA LLC BK/PG 42956/382 PB/PL 564/157 32 HASTINGS STREET PID 11-142-32
N/F ONE EMERSON STREET, INC BK/PG 28292/227 PB/PL 495/84 1 EMERSON STREET PID 11-126-1
SCALE: 1" = 40'

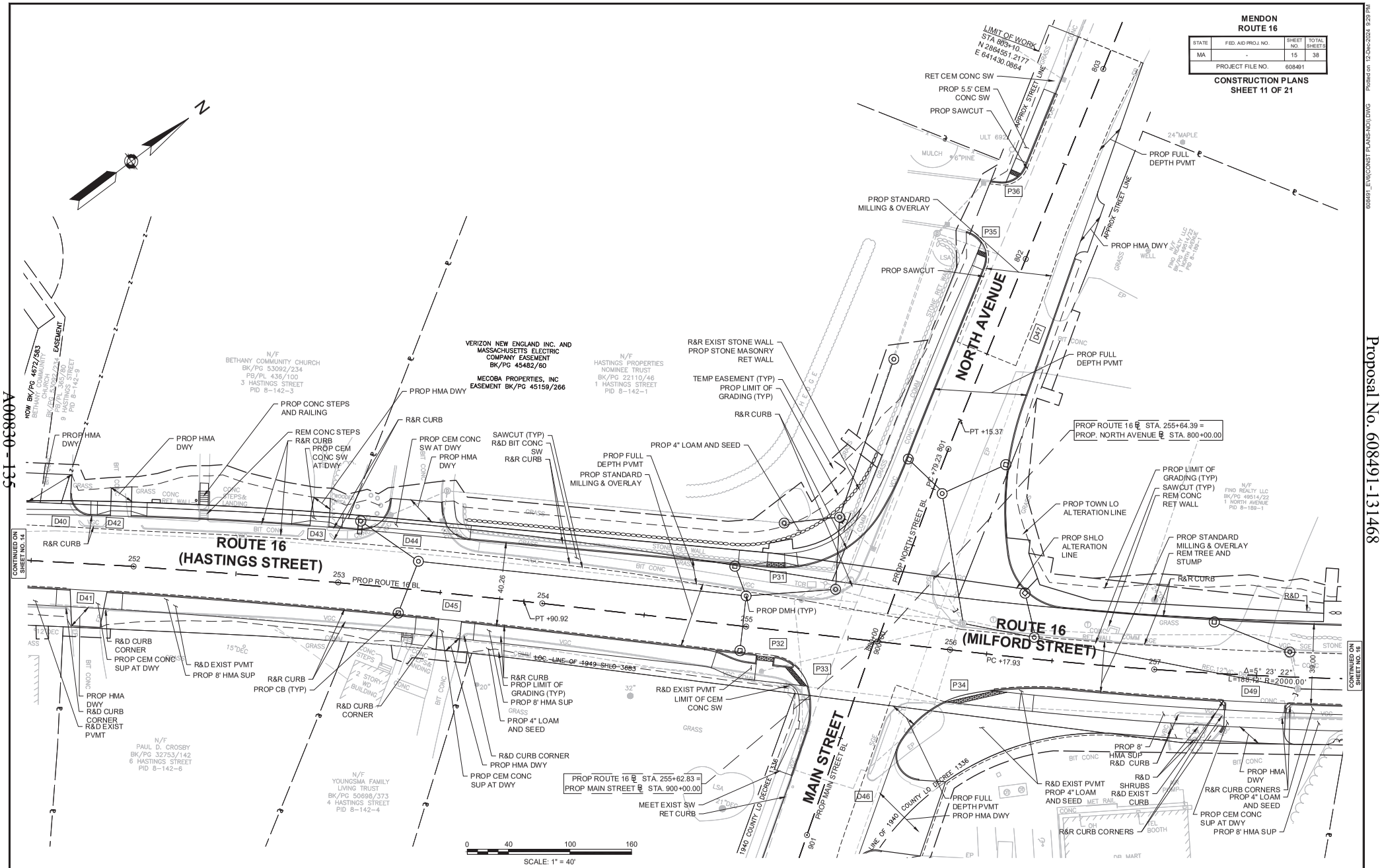

MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 9 OF 21
STATE
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608491
SHEET NO.
13
TOTAL SHEETS
38
CONTINUED ON SHEET NO. 14
CONTINUED ON SHEET NO. 12
ROUTE 16 (HASTINGS STREET)
MAPLE STREET
EMERSON STREET
WASHINGTON STREET
PROP ROUTE 16 BL STA. 242+54.52 = PROP MAPLE STREET BL STA. 700+00.00
PROP ROUTE 16 BL STA. 240+31.99 = PROP EMERSON STREET BL STA. 600+00.00
PROP ROUTE 16 BL STA. 240+06.22 = PROP. WASHINGTON ST BL STA. 500+00.00
PROP MAPLE ST BL
PROP EMERSON ST BL
PROP WASHINGTON ST BL
PROP ROUTE 16 BL
PROP 8" HMA SUP
PROP 4" LOAM AND SEED
PROP STANDARD MILLING AND OVERLAY
PROP FULL DEPTH PVMT
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP HMA WALKWAY
PROP 6.5' CEM CONC SW
PROP CEM CONC MEDIAN ISLAND
PROP TEMP EASEMENT (TYP)
PROP PERM UTILITY EASEMENT (TYP)
PROP TREE CLEARING AND GRUBBING
PROP LIMIT OF GRADING (TYP)
PROP LIMIT OF TREE CLEARING AND GRUBBING
PROP HMA CURB
PROP SHLD ALTERATION LINE R&R CURB
PROP 7' HMA SW
PROP CEM CONC PLAZA
PROP CB (TYP)
PROP DMH (TYP)
PROP R&R CURB
PROP R&R CURB CORNER
PROP R&S
PROP R&D EXIST BUSH
PROP R&D CONC CURB
PROP R&D GRAN CURB
PROP R&D EXIST BUSH
PROP R&D EXIST CEM CONC SW
PROP R&R CURB
PROP R&R EXIST STONE WALL
PROP R&R (BO) MEMORIAL
PROP R&R EXIST CONC STEPS
PROP CONC STEPS
PROP R&R EXIST TREE AND STUMP
PROP R&R MONUMENT
PROP R&D EXIST PVMT
PROP 12" DEC DOUBLE
PROP 8" HMA SUP
PROP 4" LOAM AND SEED
PROP STANDARD MILLING AND OVERLAY
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP 4" LOAM AND SEED
PROP TEMP EASEMENT (TYP)
PROP PERM UTILITY EASEMENT (TYP)
PROP FULL DEPTH PVMT
PROP HMA CURB
PROP HMA CURB MEET EXIST.
REM EXIST CONC WALKWAY
REM EXIST CONC STEPS
REM HEDGES
REM STUMP
REM TREE AND STUMP
REM CONC RET WALL
REM EXIST TREE AND STUMP
REM R&D CURB CORNER
REM R&D EXIST BUSH
REM 1 TREE AND STUMP
RET 3 TREES
RET TREE
RET STONE RET WALL
TEMP EASEMENT (TYP)
TEMP PERM UTILITY EASEMENT (TYP)
LOC. LINE OF 1949 SHLD
LOC. LINE OF 1949 SHLD
REC. 15"VC-DRAIN
APPROX STREET LINE
APPROX STREET LINE
APPROX STREET LINE
APPROX STREET LINE
END PROP SHLD ALTERATION
LIMIT OF WORK STA 501+00 N 2863210.0987 E 640595.9976
LIMIT OF WORK STA 601+86 N 2863002.8272 E 640796.7156
LIMIT OF WORK STA 702+50 N 2862024.9808 E 641095.5362
MENDON CENTER HISTORIC DISTRICT
WOODED AREA
GRANITE BLOCKS
GRAVEL
2 STORY WD BUILDING #17 MAPLE STREET
2 STORY WD BUILDING
1 STORY WD BUILDING
N/F MENDON HISTORICAL SOCIETY OF MENDON BK/PG 57205/276 17 HASTINGS STREET PID 11-142-14
N/F MENDON CORPORATION BK/PG 8120/76 17 MAPLE STREET PID 11-142-14
N/F HACKENSON CORPORATION BK/PG 43873/254 21 HASTINGS STREET PID 11-142-21
N/F STEPHEN M. HACKENSON BK/PG 57271/275 19 HASTINGS STREET PID 11-142-19
N/F THEODORE C. CARLSON BK/PG 10157/135 29 MAPLE STREET PID 11-142-1
N/F CARRIE L. RICE BK/PG 58593/208 36 MAPLE STREET PID 11-175-36
N/F JOHN A. COLLINS JR. AND SHARON A. COLLINS BK/PG 5983/110 38 MAPLE STREET PID 11-175-38
N/F GILMORE FAMILY IRREVOCABLE TRUST BK 421 65 PG 292 PID 11-142-23
N/F GILMORE FAMILY IRREVOCABLE TRUST BK/PG 42165/292 23 HASTINGS STREET PID 11-142-23
SCALE: 1" = 40'
0
40
100
160



A00830 - 134

Proposal No. 608491-131468

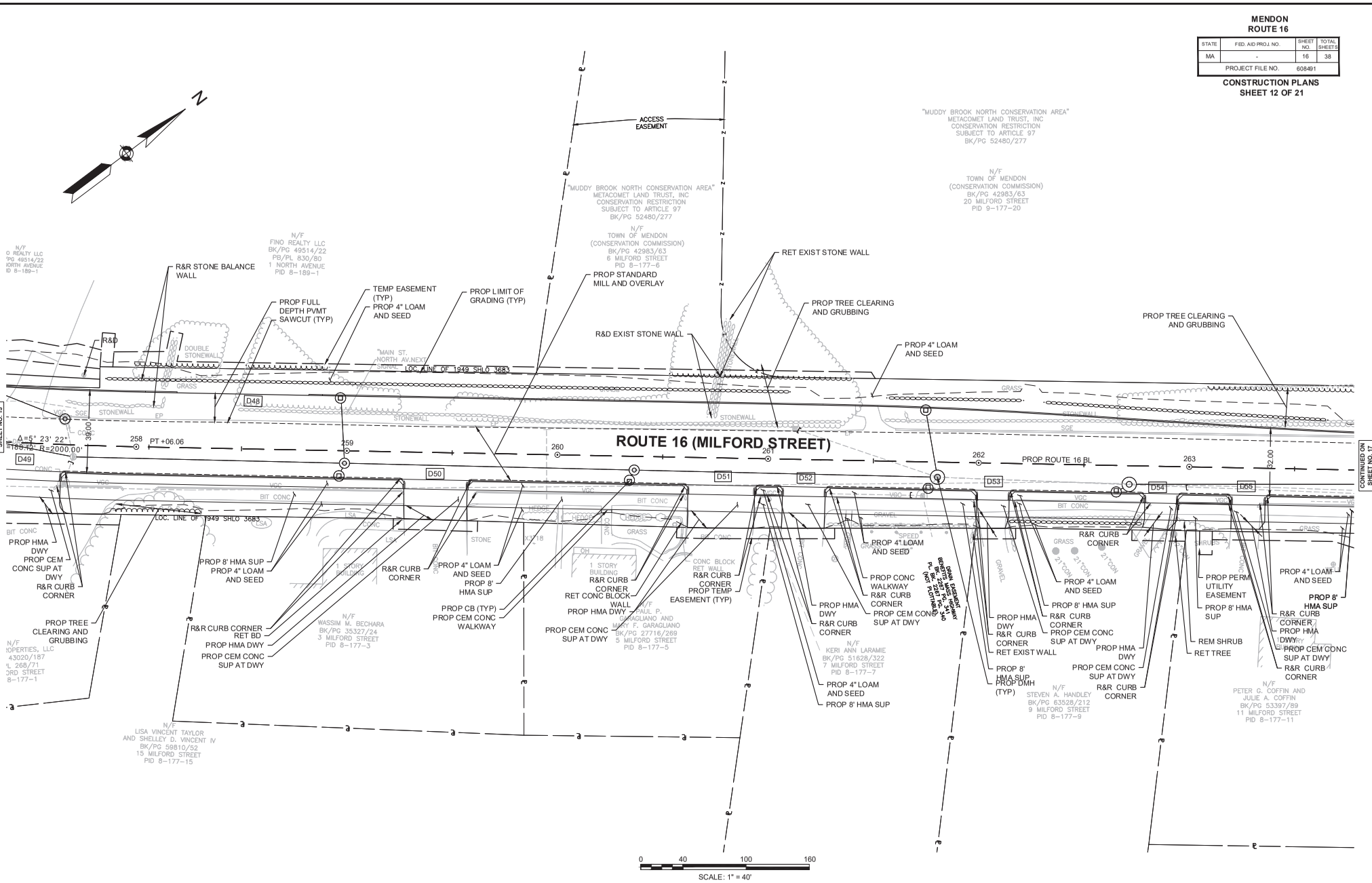
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A00830-135

Proposal No. 608491-131468

608491_EVE(CONST PLANS-NOI).DWG Plotted on 12-Dec-2024 9:29 PM



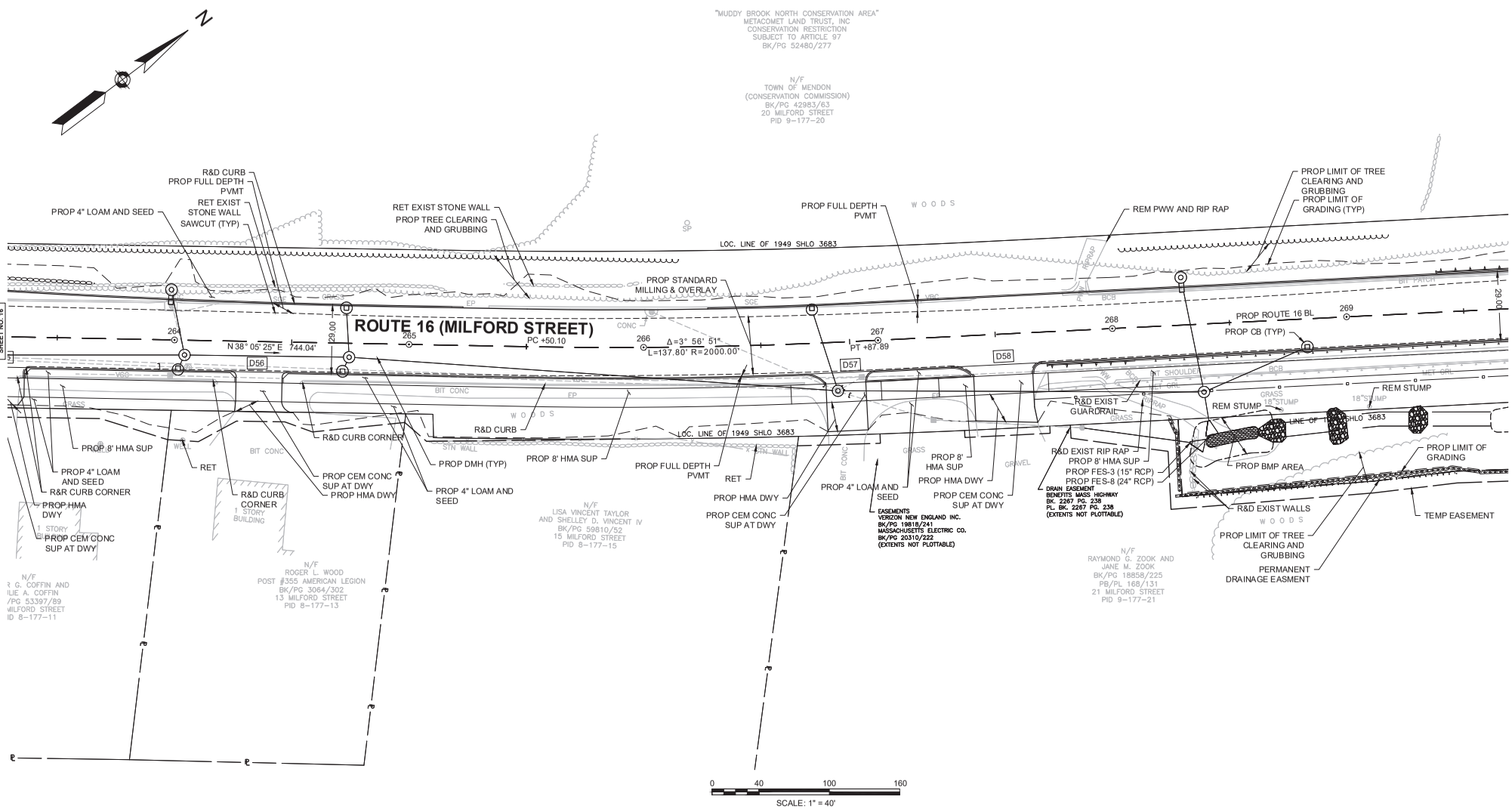
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Proposal No. 608491-131468

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	38
PROJECT FILE NO.	608491		

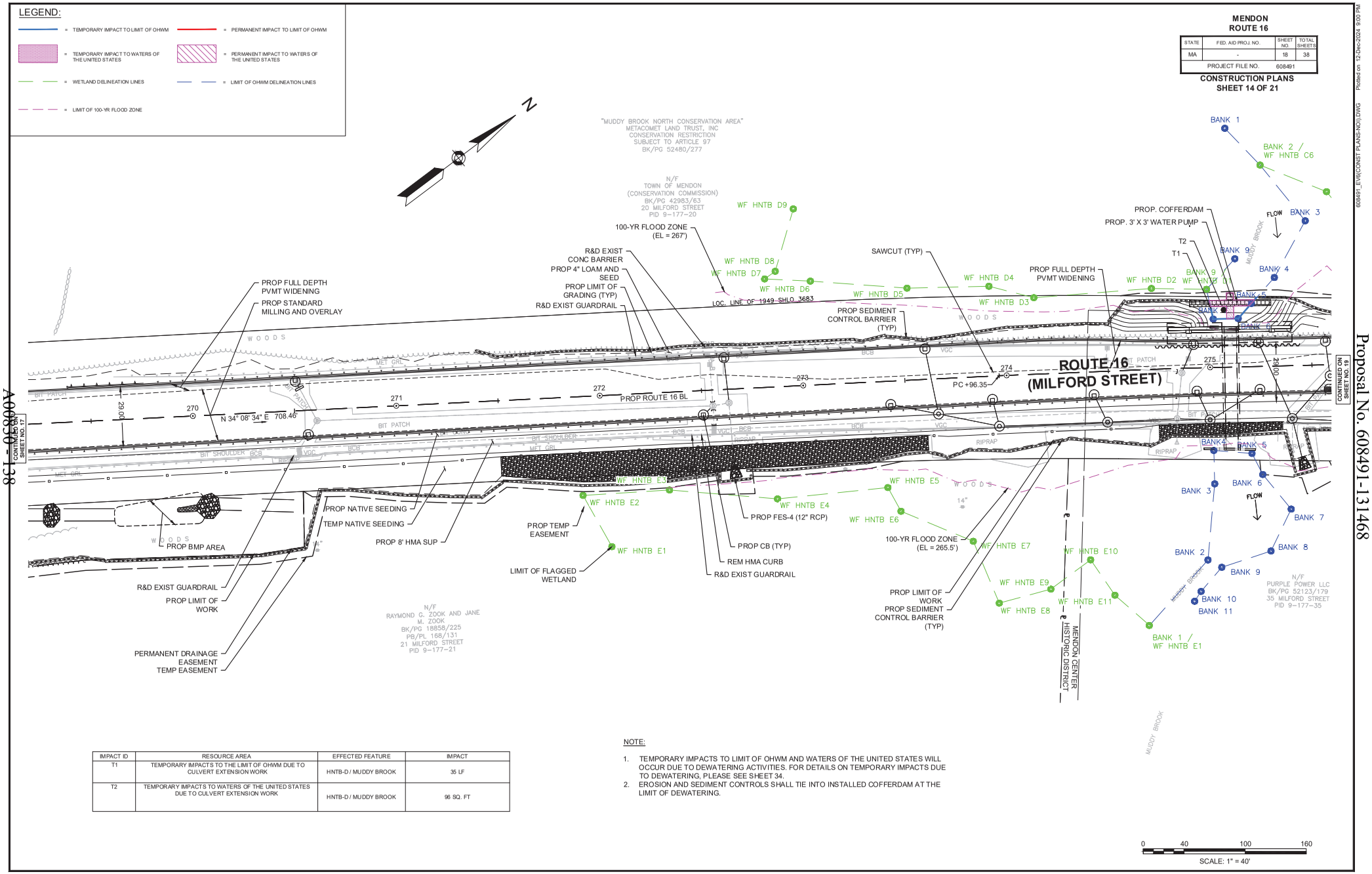
CONSTRUCTION PLANS
SHEET 13 OF 21



A00830-137

Proposal No. 608491-131468

608491_EVB(CONST PLANS-NOI).DWG Plotted on 12-Dec-2024 8:55 PM



IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T1	TEMPORARY IMPACTS TO THE LIMIT OF OHWM DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	35 LF
T2	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	96 SQ. FT

NOTE:

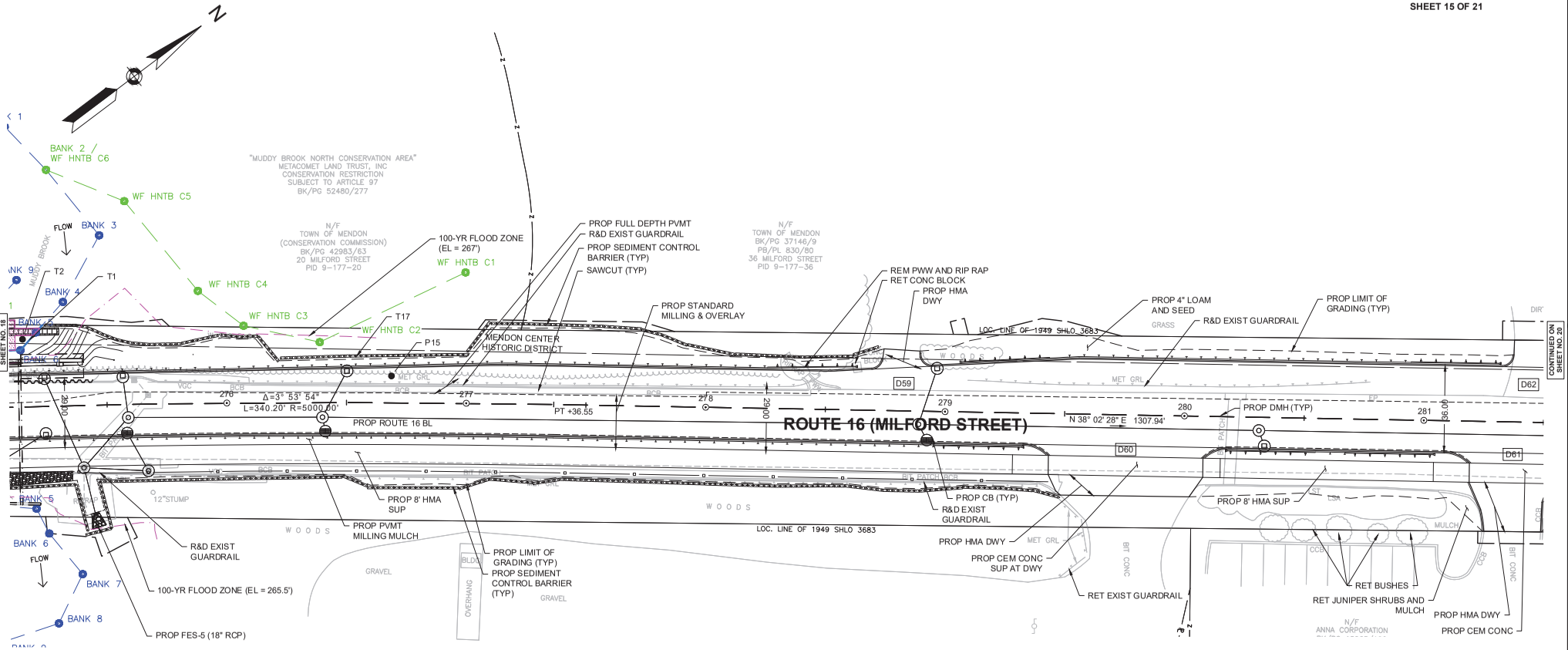
1. TEMPORARY IMPACTS TO LIMIT OF OHWM AND WATERS OF THE UNITED STATES WILL OCCUR DUE TO DEWATERING ACTIVITIES. FOR DETAILS ON TEMPORARY IMPACTS DUE TO DEWATERING, PLEASE SEE SHEET 34.
2. EROSION AND SEDIMENT CONTROLS SHALL TIE INTO INSTALLED COFFERDAM AT THE LIMIT OF DEWATERING.

Plotted on 12-Dec-2024 9:00 PM
608491_EVB(CONST PLANS-NOI).DWG
Proposal No. 608491-131468
A000830-1138

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 15 OF 21



0 40 100 160

SCALE: 1" = 40'

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T1	TEMPORARY IMPACTS TO THE LIMIT OF OHWM DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	35 LF
T2	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	96 SQ. FT

NOTE:

1. TEMPORARY IMPACTS TO LIMIT OF OHWM AND WATERS OF THE UNITED STATES WILL OCCUR DUE TO DEWATERING ACTIVITIES. FOR DETAILS ON TEMPORARY IMPACTS DUE TO DEWATERING, PLEASE SEE SHEET 34.
2. EROSION AND SEDIMENT CONTROLS SHALL TIE INTO INSTALLED COFFERDAM AT THE LIMIT OF DEWATERING.

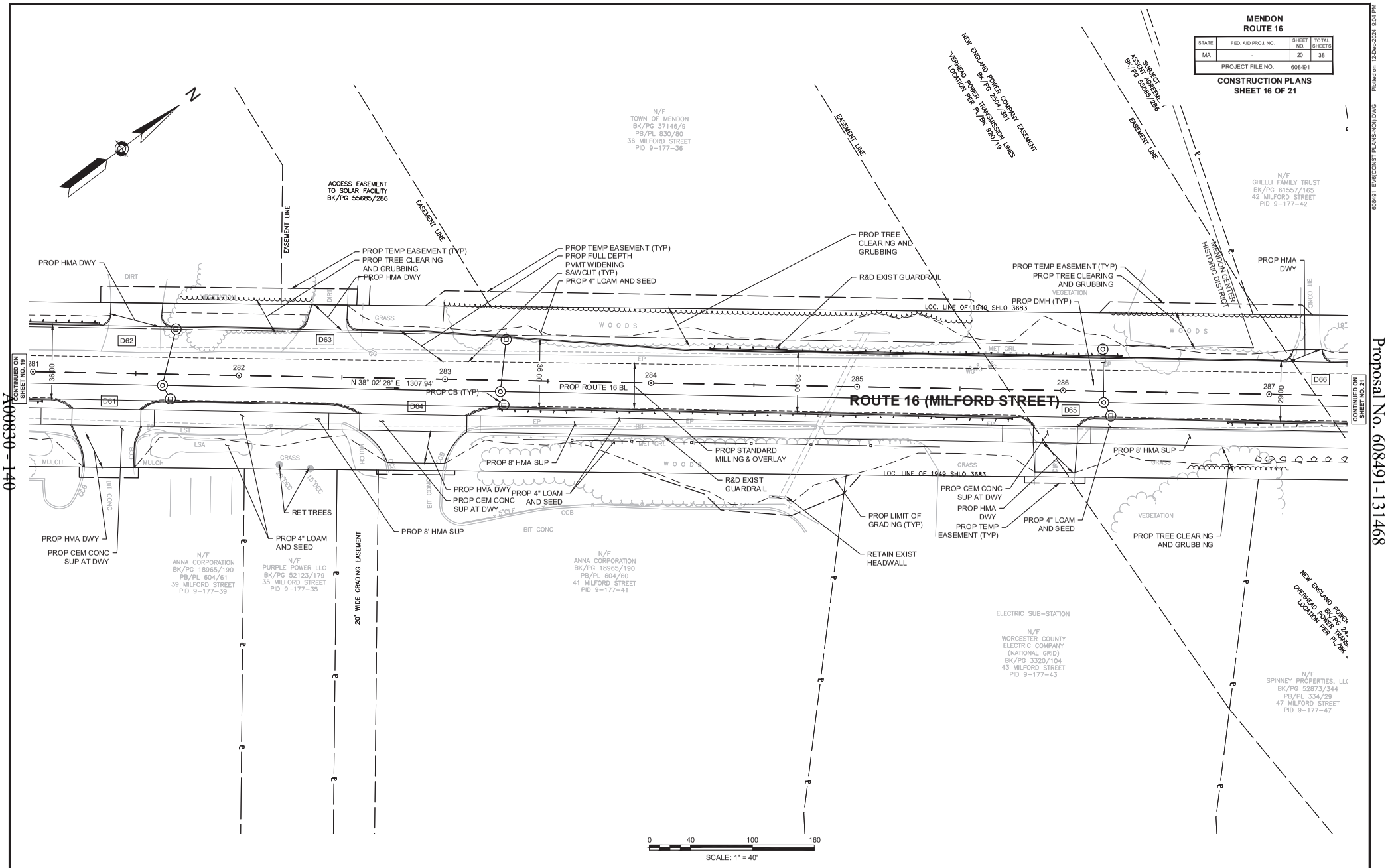
LEGEND:

- = TEMPORARY IMPACT TO LIMIT OF OHWM
- = PERMANENT IMPACT TO LIMIT OF OHWM
- = TEMPORARY IMPACT TO WATERS OF THE UNITED STATES
- = PERMANENT IMPACT TO WATERS OF THE UNITED STATES
- = WETLAND DELINEATION LINES
- = LIMIT OF OHWM DELINEATION LINES
- = LIMIT OF 100-YR FLOOD ZONE

A0008830 - 139

Proposal No. 608491-131468

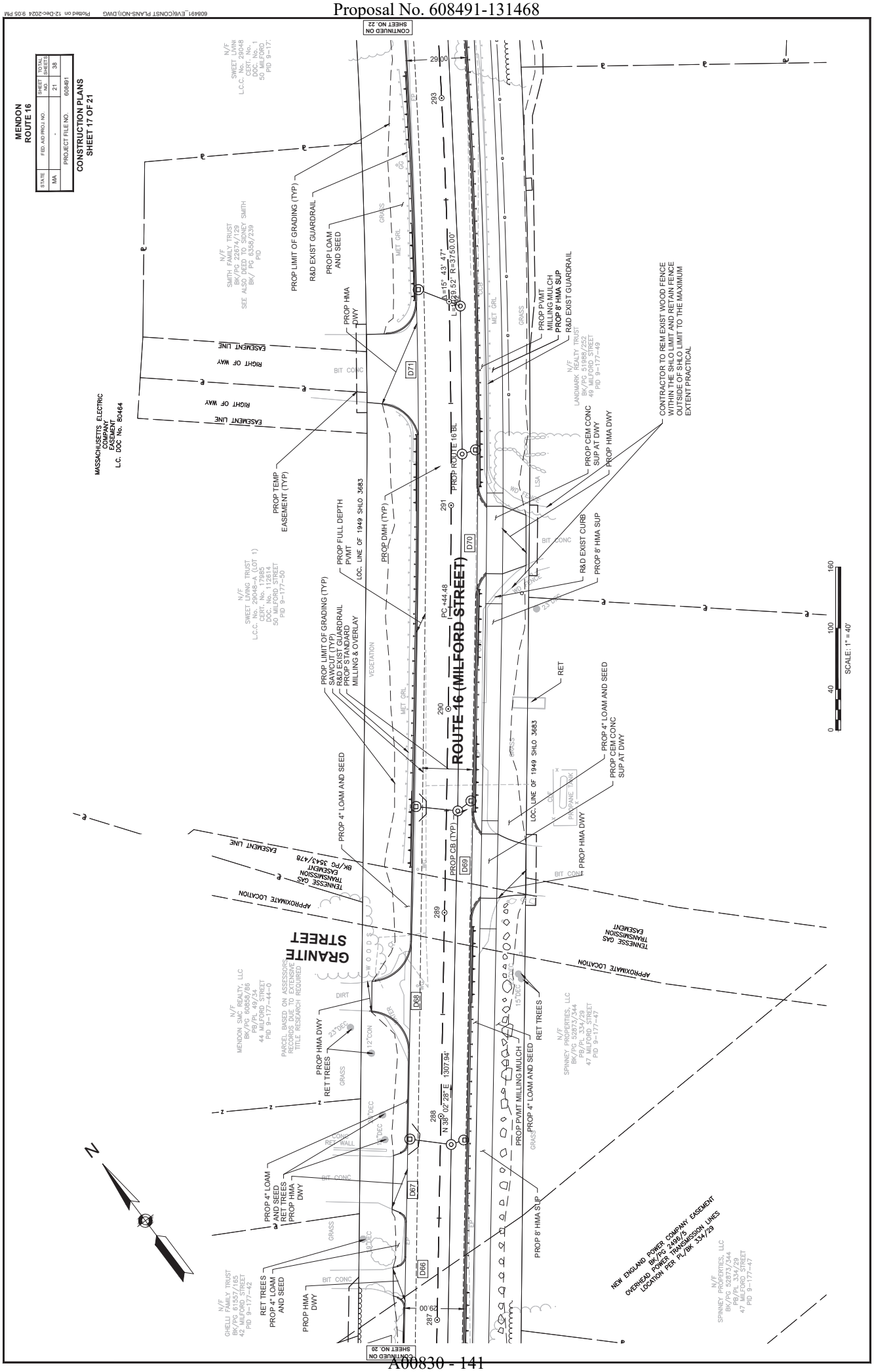
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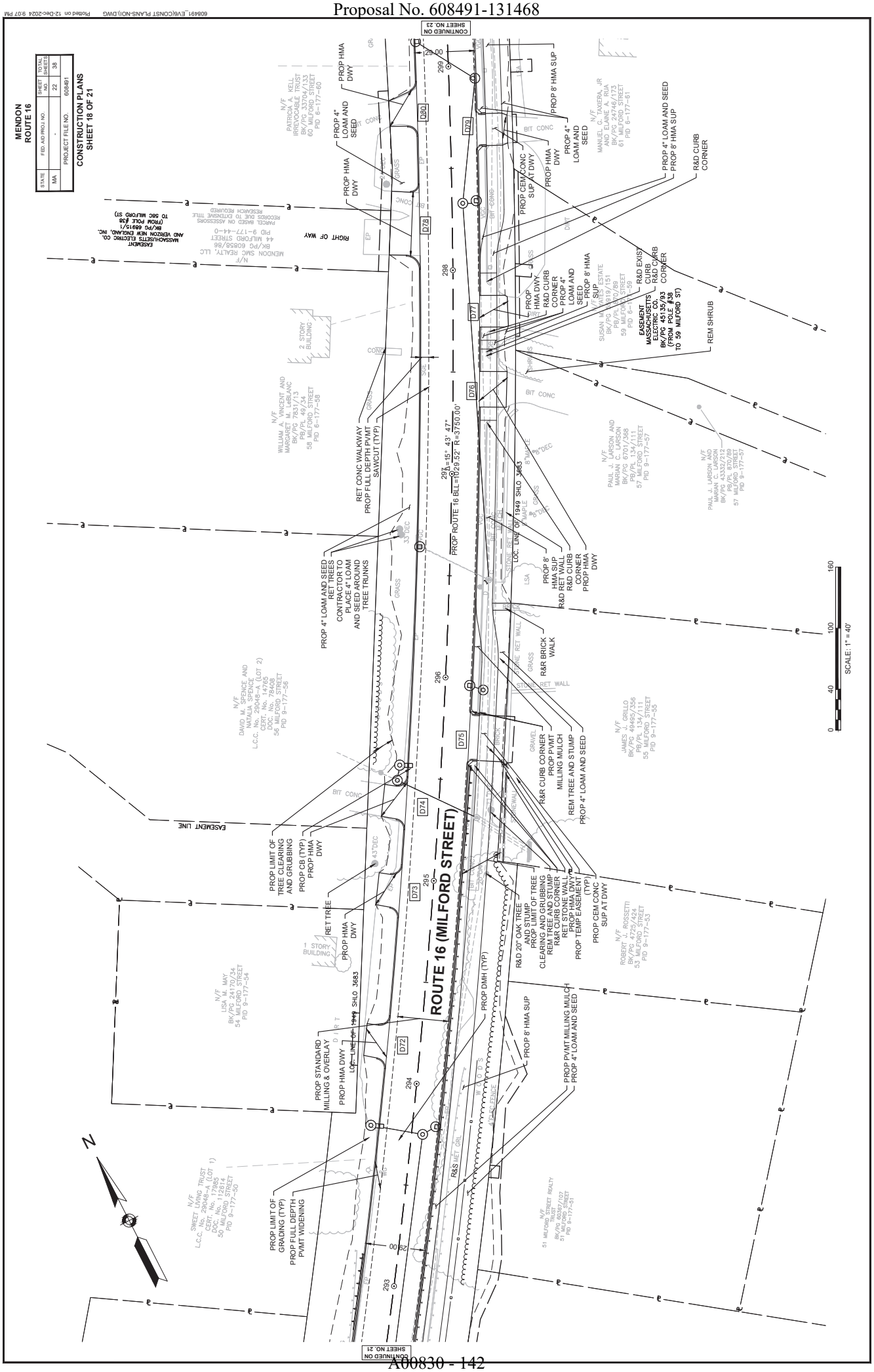


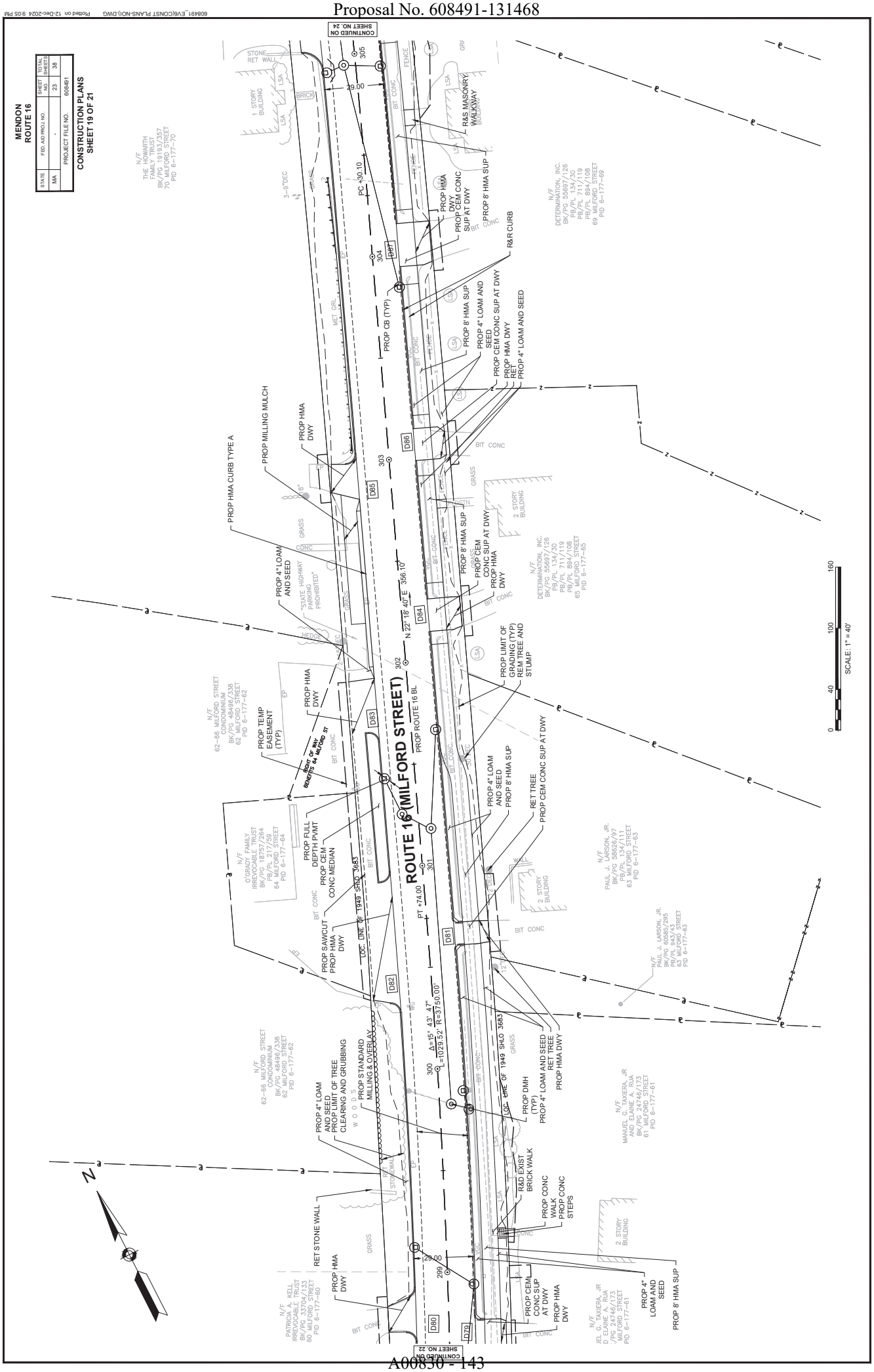
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Proposal No. 608491-131468

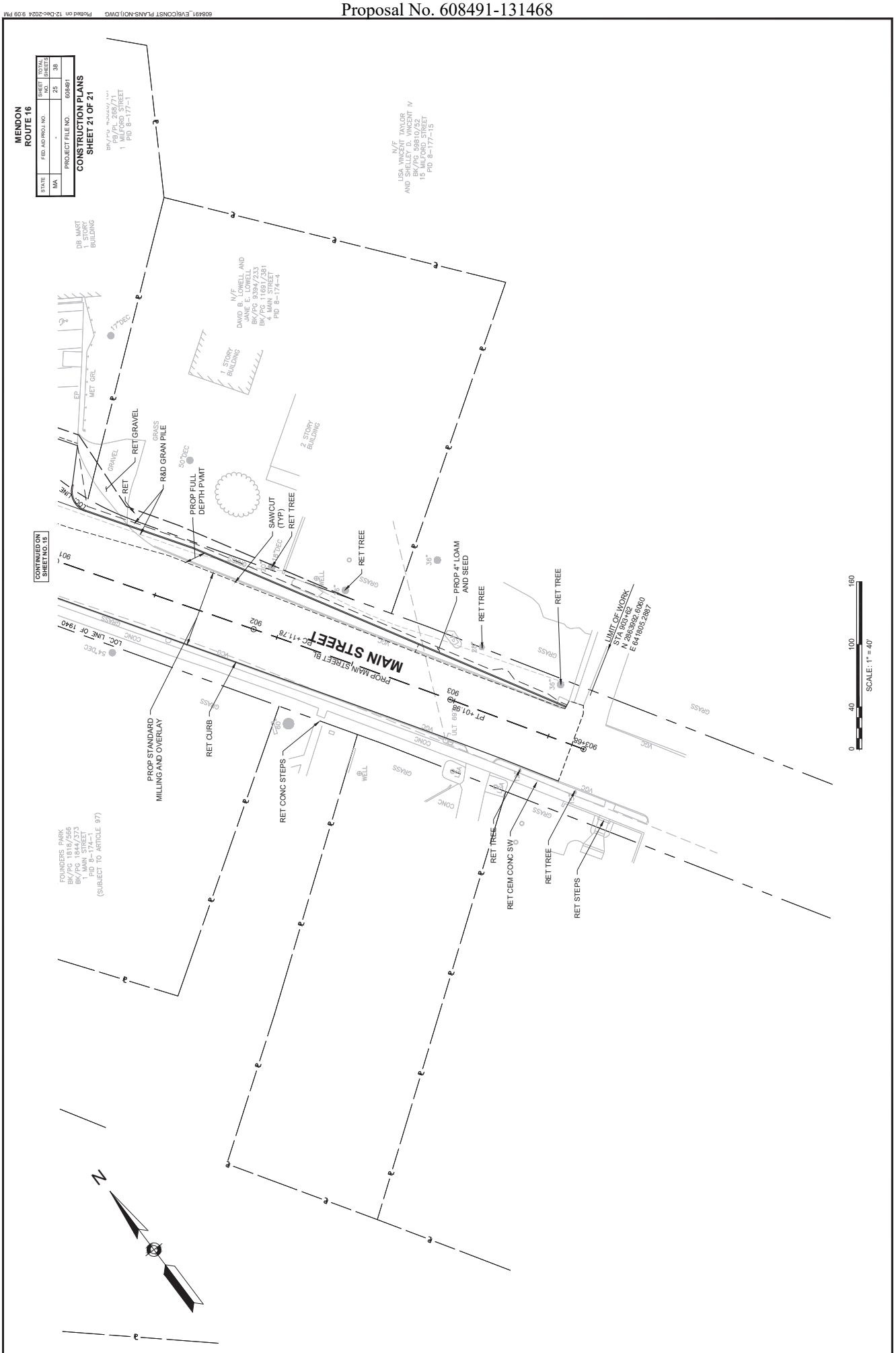
A00830 - 140

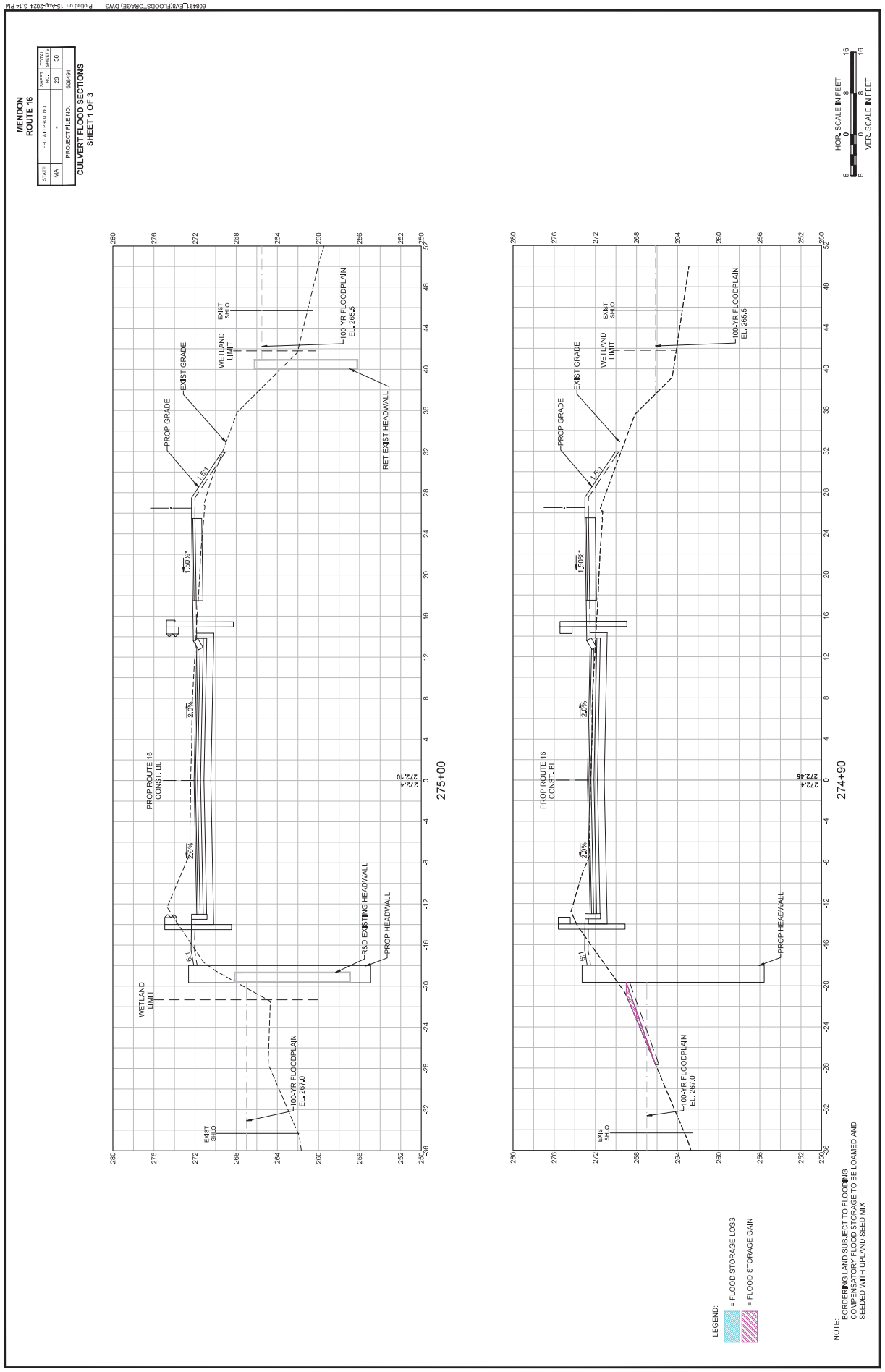

MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 17 OF 21
STATE
MA.
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608491
SHEET NO.
21
TOTAL SHEETS
38
ROUTE 16 (MILFORD STREET)
GRANITE STREET
PROP ROUTE 16 BL
PC 44.48
LOC. LINE OF 1949 SHLO 3683
PROP LIMIT OF GRADING (TYP)
R&D EXIST GUARDRAIL
PROP LOAM AND SEED
PROP HMA DWY
PROP PVMT MILLING MUCH
PROP 8" HMA SUP
PROP TEMP EASEMENT (TYP)
PROP DMH (TYP)
PROP FULL DEPTH PVMT
PROP STANDARD MILLING & OVERLAY
PROP CEM CONC SUP AT DWY
PROP 8" HMA SUP
R&D EXIST CURB
PROP 4" LOAM AND SEED
PROP CB (TYP)
PROP PVMT MILLING MUCH
RET TREES
PROP 8" HMA SUP
CONTRACTOR TO REM EXIST WOOD FENCE WITHIN THE SHLO LIMIT AND RETAIN FENCE OUTSIDE OF SHLO LIMIT TO THE MAXIMUM EXTENT PRACTICAL
EASEMENT LINE
RIGHT OF WAY
MASSACHUSETTS ELECTRIC COMPANY EASEMENT L.C. DOC. No. 80464
TENNESSE GAS TRANSMISSION EASEMENT BK/PG 3543/478
APPROXIMATE LOCATION
NEW ENGLAND POWER COMPANY EASEMENT OVERHEAD POWER TRANSMISSION LINES LOCATION PER PL/BK 334/29
CONTINUED ON SHEET NO. 22
CONTINUED ON SHEET NO. 20
SCALE: 1" = 40'
N
608491_E1VB(CONST PLANS-NO1).DWG Plotted on 12-Dec-2024 9:05 PM

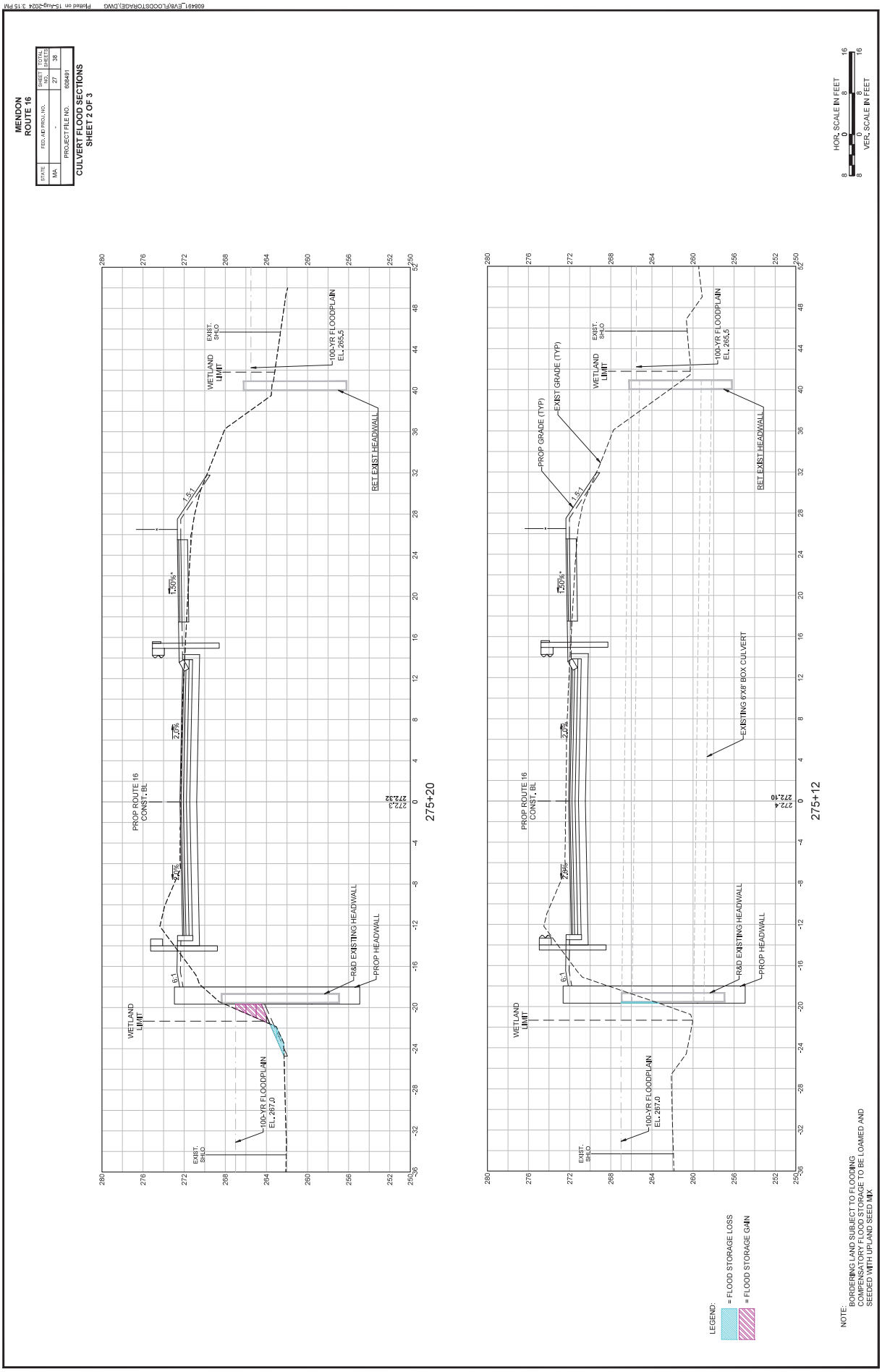

MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 18 OF 21
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA.
-
22
38
PROJECT FILE NO.
608491
CONTINUED ON SHEET NO. 23
CONTINUED ON SHEET NO. 21
ROUTE 16 (MILFORD STREET)
PROP ROUTE 16 BLL=1029.52' R=3750.00'
Δ=15° 43' 47"
LOC. LINE OF 1949 SHLO 3683
PROP 8' HMA SUP
PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SUP AT DWY
R&D CURB CORNER
PROP 4" LOAM AND SEED PROP 8' HMA SUP
R&D CURB CORNER
REM SHRUB
PROP 4" LOAM AND SEED RET TREES CONTRACTOR TO PLACE 4" LOAM AND SEED AROUND TREE TRUNKS
RET CONC WALKWAY PROP FULL DEPTH PVMT SAWCUT (TYP)
PROP 8' HMA SUP R&D RET WALL R&D CURB CORNER PROP HMA DWY
R&R BRICK WALK
PROP LIMIT OF TREE CLEARING AND GRUBBING
PROP CB (TYP)
RET TREE
REM TREE AND STUMP
PROP 4" LOAM AND SEED
R&R CURB CORNER PROP PVMT MILLING MULCH
PROP TEMP EASEMENT (TYP)
PROP CEM CONC SUP AT DWY
R&D 20" OAK TREE AND STUMP PROP LIMIT OF TREE CLEARING AND GRUBBING REM TREE AND STUMP R&R CURB CORNER RET STONE WALL PROP HMA DWY
PROP DMH (TYP)
PROP 8' HMA SUP
PROP PVMT MILLING MULCH PROP 4" LOAM AND SEED
PROP STANDARD MILLING & OVERLAY
PROP HMA DWY
PROP LIMIT OF GRADING (TYP)
PROP FULL DEPTH PVMT WIDENING
EASEMENT MASSACHUSETTS ELECTRIC CO. BK/PC 6891/1 (FROM POLE #39 TO 59C MILFORD ST)
EASEMENT LINE
RIGHT OF WAY
SCALE: 1" = 40'
N

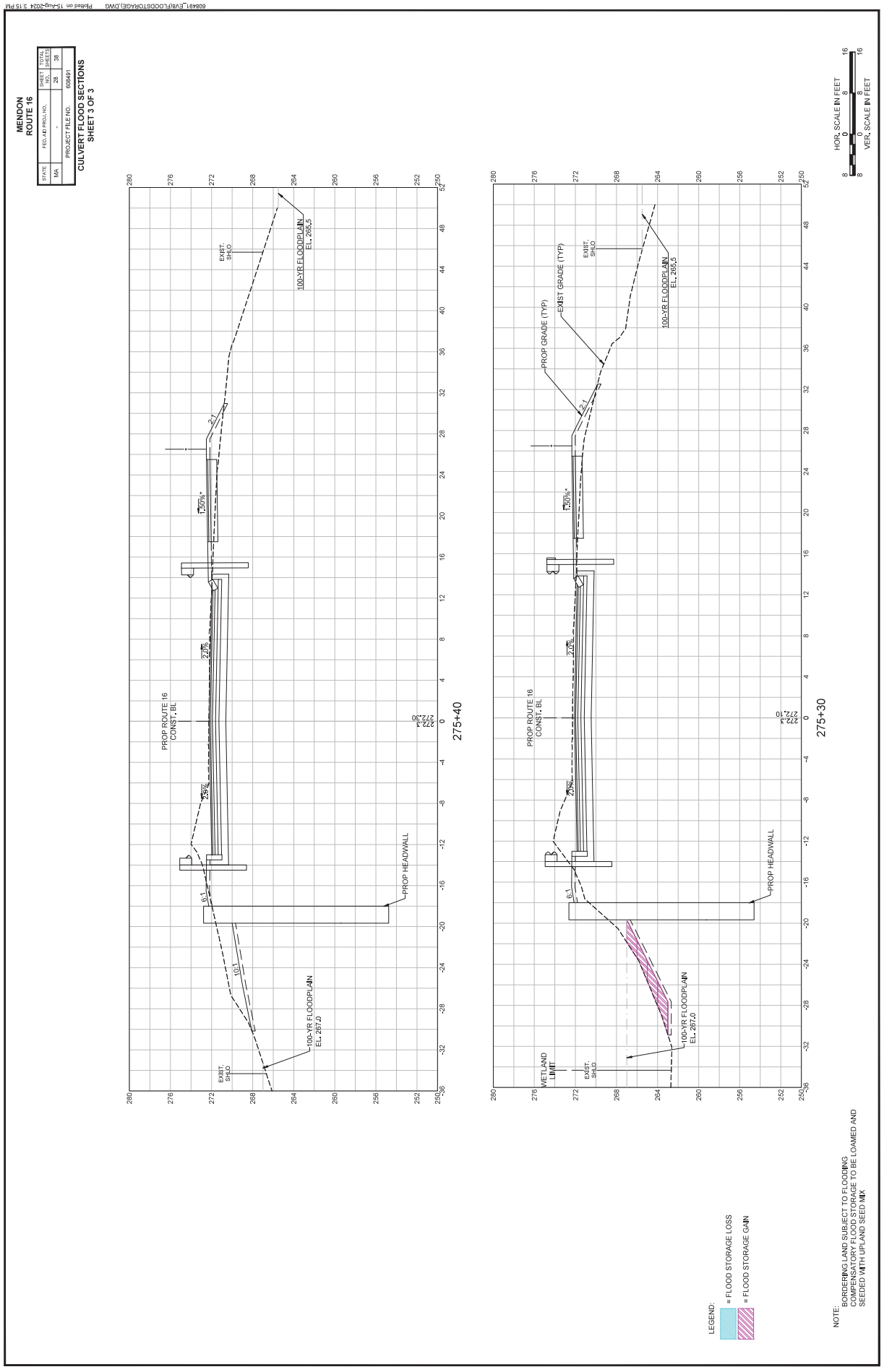

MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 19 OF 21
STATE | FED. AID PROJ. NO. | SHEET NO. | TOTAL SHEETS
MA | - | 23 | 38
PROJECT FILE NO. 608491
ROUTE 16 (MILFORD STREET)
PROP ROUTE 16 BL
PC 430.10
PT +74.00
LOC. LINE OF 1949 SHLO 3683
Δ=15° 43' 47"
L=1029.52' R=3750.00'
N 22° 18' 40" E 356.10'
CONTINUED ON SHEET NO. 24
CONTINUED ON SHEET NO. 22
PROP HMA CURB TYPE A
PROP MILLING MULCH
PROP HMA DWY
PROP 4" LOAM AND SEED
PROP TEMP EASEMENT (TYP)
PROP FULL DEPTH PVMT
PROP CEM CONC MEDIAN
PROP SAWCUT
PROP LIMIT OF GRADING (TYP)
REM TREE AND STUMP
PROP 8" HMA SUP
PROP CEM CONC SUP AT DWY
PROP HMA RET
PROP 4" LOAM AND SEED
R&R CURB
PROP CB (TYP)
PROP CEM CONC SUP AT DWY
RET TREE
PROP CEM CONC SUP AT DWY
PROP 4" LOAM AND SEED
PROP LIMIT OF TREE CLEARING AND GRUBBING
PROP STANDARD MILLING OVERLAY
PROP DMH (TYP)
PROP 4" LOAM AND SEED
RET TREE
PROP HMA DWY
R&D EXIST BRICK WALK
PROP CONC WALK
PROP CONC STEPS
RET STONE WALL
PROP CEM CONC SUP AT DWY
PROP HMA DWY
PROP 4" LOAM AND SEED
PROP 8" HMA SUP
R&S MASONRY WALKWAY
"STATE HIGHWAY PARKING PROHIBITED"
BENCHMARK #4 MILFORD ST
N/F THE HOWARTH FAMILY TRUST BK/PG 61913/357 70 MILFORD STREET PID 6-177-70
N/F 62-66 MILFORD STREET CONDOMINIUM BK/PG 48496/338 62 MILFORD STREET PID 6-177-62
N/F O'GRADY FAMILY IRREVOCABLE TRUST BK/PG 18757/264 PB/PL 134/30 64 MILFORD STREET PID 6-177-64
N/F PATRICIA A. KELL REVOCABLE TRUST BK/PG 33704/133 60 MILFORD STREET PID 6-177-60
N/F MANUEL G. TAVIERA, JR AND ELAINE A. RUA BK/PG 24746/173 61 MILFORD STREET PID 6-177-61
N/F PAUL J. LARSON, JR. BK/PG 58626/97 PB/PL 134/111 63 MILFORD STREET PID 6-177-63
N/F DETERMINATION, INC. BK/PG 55697/126 PB/PL 134/30 PB/PL 771/19 PB/PL 894/108 65 MILFORD STREET PID 6-177-65
N/F DETERMINATION, INC. BK/PG 55697/126 PB/PL 134/30 PB/PL 771/19 PB/PL 894/108 69 MILFORD STREET PID 6-177-69
SCALE: 1" = 40'

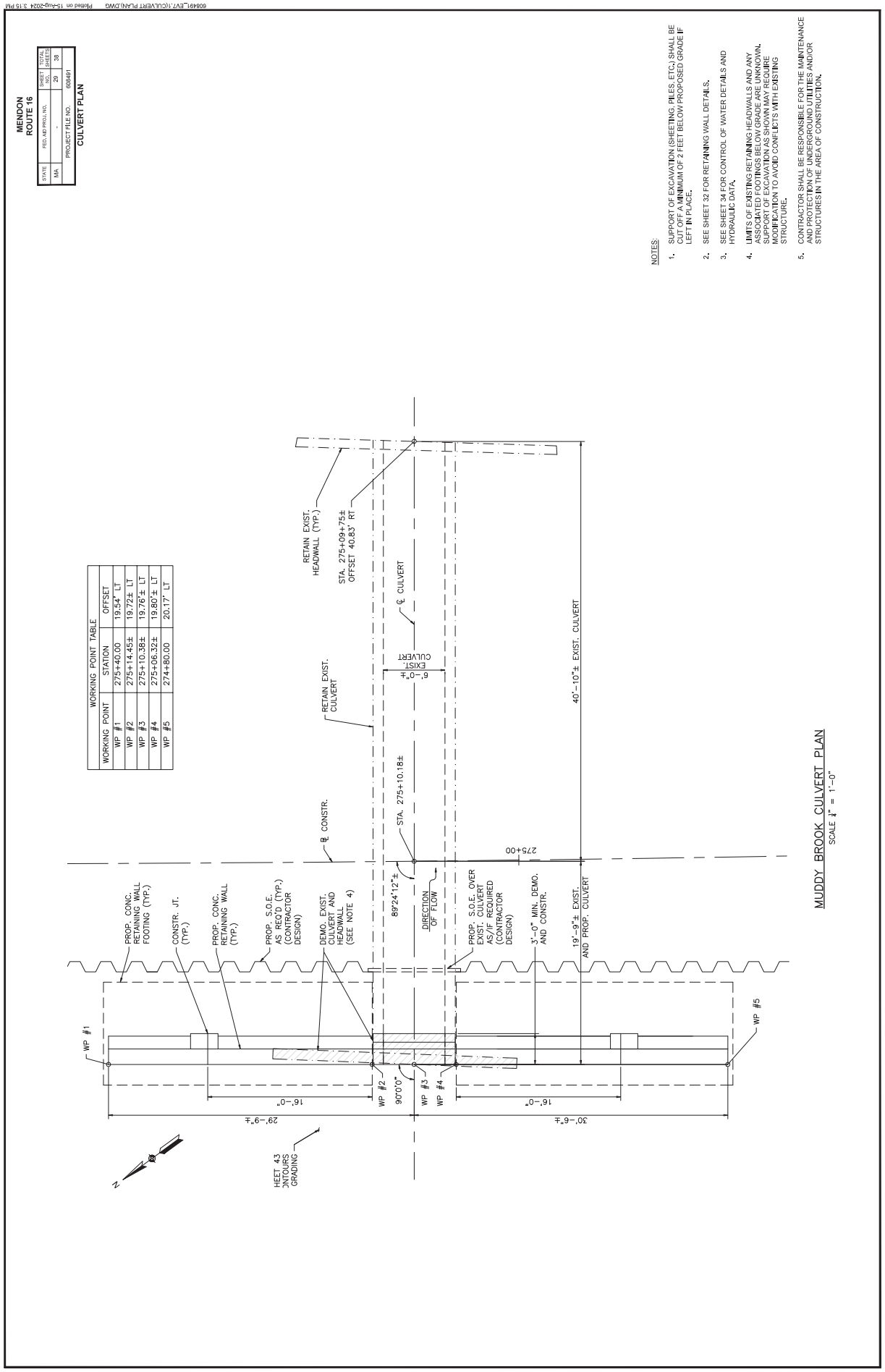

MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 20 OF 21
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
24
38
PROJECT FILE NO.
608491
608491_EVE(CONST PLANS-NO1).DWG
Plotted on 12-Dec-2024 9:08 PM
(MILFORD STREET)
ROUTE 16
HOPEDALE
MENDON
EIGHT ROD ROAD
HARRINGTON STREET
APPROXIMATE LOCATION
PROJECT END LIMIT OF PVMT STA 307+76 N 2868605.7603 E 644482.0624
STANDARD MILLING & OVERLAY
PROP GRAN CURB, TYPE VB (TYP)
RET UP
PROP TEMP EASEMENT
PROP OLD PVMT EXC.
MEET EXIST RETAIN FENCE
PROP LOAM & SEED
PROP 5HMA SW
SAWCUT
LOC. LINE OF 1951 COUNTY 3126
PROP 5' CEM CONC SW
PROP DWY
PROP CEM CONC MEDIAN
PROP ROUTE 16
PROP GRAN. EDGING, TYPE VB (TYP)
PROP 5' HMA BIKE RAMP
R&R VGC
BEGIN PROP SHLD ALTERATION @ STA 307+04
PROP 4" LOAM AND SEED
PROP LIMIT OF GRADING (TYP)
PROP 5' CEM. CONC. SW
PROP CONC WALK
RET CONC STEPS AND PATH
END PROP SHLD ALTERATION @ STA 307+52
R&D CURB CORNER
MEET EXIST
TEMP EASEMENT
RET MHB
R&R CURB CORNER
PROP CEM CONC SLP AT DWY
PROP HMA DWY
PROP CEM CONC MEDIAN
PROP SAWCUT
PROP HMA DWY
PROP TEMP EASEMENT
RET STONE WALL
PROP 5' CEM CONC SW
RET UP & MHB
PROP GRAN. CURB, TYPE VB
PROP CEM CONC MEDIAN
PROP GRAN. CURB, TYPE VB (1' REVEAL)
PROP LIMIT OF GRADING
PROP 6' HMA BIKE RAMP
PROP CEM CONC MEDIAN
PROP CONC PCR (TYP)
PROP TEMP EASEMENT
PROP LOAM & SEED
PROP STANDARD MILLING & OVERLAY
RET CEM CONC STEPS
PROP GRAN CURB TYPE VB
LOC. LINE OF 1949 SHLD
RET HYD
RET UP
PROP CURB TRANSITION
PROP HMA DWY
PROP CURB TRANSITION
PROP DMH
PROP CB (TYP)
RET BRICK WALK
1 STORY BUILDING
STONE RET WALL
LSA
BRICK
PROP CEM CONC MEDIAN
PROP GRAN. CURB, TYPE VB
PROP STANDARD MILLING & OVERLAY
RET STAIRS
R&R MASONRY WALKWAY
2 STORY BUILDING
RET LSA
PROP FULL DEPTH PVMT
PROP 8" HMA SUP
RET FENCE
TEMP EASEMENT (TYP)
R&R VGC
RET TREE
TEMP EASEMENT
PROP 8' CEMENT CONC. SUP
PROP SHLD 3683
RET TREE AND STUMP
PROP 8' CEMENT CONC. SUP
PROP SHLD 3683
R&D CURB CORNERS
PROP CONC PCR (TYP)
N 20° 22' 27" E 99.79'
PC +65.11
PT +65.32
R=35.00'
Δ=1° 56' 13"
L=135.23'
R=4000.00'
P38
P39
P40
D88
D89
D90
305
306
307
308
309
309+76.30
PT +34.58
29.00
BIT CONC
GRASS
FENCE
VGC
SEWER
STONE RET WALL
COMM. LINE 30" ENDS AT UTILITY POLE
(LIFE ESTATE TO ANGELO J. ROSATI) ANGELO J. ROSATI GLORIA M. ROSATI BK/PG 42352/282 PB/PL 271/68 24 MENDON ST PID 125-231-0
N/F PETER W. ROSATI AND ELAINE ASHTON ROSATI LIFE ESTATE TO ANGELO J. ROSATI GLORIA M. ROSATI BK/PG 42352/282 PB/PL 271/68 MENDON STREET 74 MILFORD PID 6-177-74
TOWN OF HOPEDALE BK/PG 154 MENDON ST PID 14-146-0
N/F CHRISTOPHER J. LEONCINI BK/PG 17010/114 71 MILFORD STREET PID 6-177-71
1 STORY BUILDING
2 STORY BUILDING
CONTINUED ON SHEET NO. 23
SCALE: 1" = 40'
0
40
100
160
N


MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 21 OF 21
STATE
MA.
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608491
SHEET NO.
25
TOTAL SHEETS
38
CONTINUED ON SHEET NO. 15
MAIN STREET
PROP MAIN STREET SL
PC +11.78
PT +01.98
LOC. LINE OF 1940
LIMIT OF WORK
STA 903+62
N 2863892.6080
E 641803.2887
PROP STANDARD MILLING AND OVERLAY
RET CURB
RET CONC STEPS
RET TREE
RET CEM CONC SW
RET TREE
RET STEPS
PROP 4" LOAM AND SEED
RET TREE
RET TREE
SAWCUT (TYP)
RET TREE
PROP FULL DEPTH P/MT
R&D GRAN PILE
RET GRAVEL
GRAVEL
GRASS
MET GRL
EP
LOC. LINE
DB MART
1 STORY
BUILDING
1 STORY
BUILDING
2 STORY
BUILDING
N/F
DAVID B. LOWELL AND
JANE E. LOWELL
BK/PG 9304/233
BK/PG 11691/381
4 MAIN STREET
PID 8-174-4
N/F
LISA VINCENT TAYLOR
AND SHELLEY G. VINCENT IV
BK/PG 8951/322
15 MILFORD STREET
PID 8-177-15
BK/PG 2488/71
1 MILFORD STREET
PID 8-177-1
FOUNDERS PARK
BK/PG 1818/566
BK/PG 8844/273
MAIN STREET
PID 8-174-1
(SUBJECT TO ARTICLE 97)
SCALE: 1" = 40'
0
40
100
160
N


608491_EVR(FLOODSTORAGE).DWG Plotted on 15-Aug-2024 3:14 PM
MENDON
ROUTE 16
STATE | FED.-AID PROJ.NO. | SHEET NO. | TOTAL SHEETS
MA | - | 26 | 38
PROJECT FILE NO. 608491
CULVERT FLOOD SECTIONS
SHEET 1 OF 3
HOR. SCALE IN FEET
VER. SCALE IN FEET
275+00
274+90
PROP GRADE
EXIST GRADE
WETLAND LIMIT
EXIST. SHLD
100-YR FLOODPLAIN EL. 265.5
RET EXIST HEADWALL
PROP ROUTE 16 CONST. BL
R&D EXISTING HEADWALL
PROP HEADWALL
100-YR FLOODPLAIN EL. 267.0
1.5:1
6:1
2.0%
1.50%*
272.4
272.10
272.45
LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN
NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND SEEDED WITH UPLAND SEED MIX


608491_EVR(FLOODSTORAGE).DWG Plotted on 15-Aug-2024 3:15 PM
MENDON
ROUTE 16
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608491
SHEET NO.
27
TOTAL SHEETS
38
CULVERT FLOOD SECTIONS
SHEET 2 OF 3
HOR. SCALE IN FEET
VER. SCALE IN FEET
275+20
275+12
PROP ROUTE 16
CONST. BL
WETLAND
LIMIT
EXIST.
SHLD
100-YR FLOODPLAIN
EL. 265.5
100-YR FLOODPLAIN
EL. 267.0
RET EXIST HEADWALL
R&D EXISTING HEADWALL
PROP HEADWALL
PROP GRADE (TYP)
EXIST GRADE (TYP)
EXISTING 6'X8' BOX CULVERT
1.5:1
6:1
1.50%*
2.07%
2.40%
2.07%
2.59%
272.32
272.3
272.10
272.4
LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN
NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND
SEEDED WITH UPLAND SEED MIX.

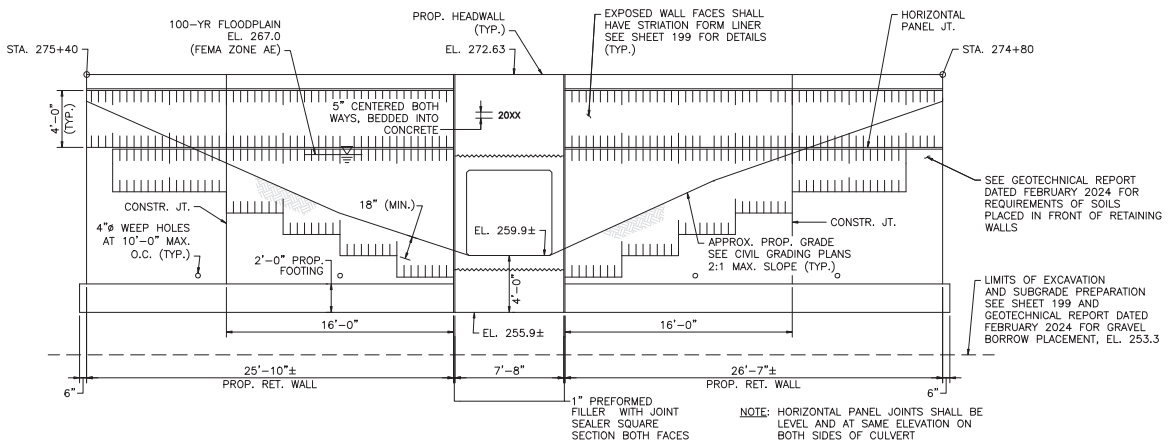

608491_E\e\PLCOSTORAGE).DWG Plotted on 15-Aug-2024 3:15 PM
MENDON
ROUTE 16
STATE
MA
FED. AID PROJ. NO.
-
SHEET NO.
28
TOTAL SHEETS
38
PROJECT FILE NO.
608491
CULVERT FLOOD SECTIONS
SHEET 3 OF 3
HOR. SCALE IN FEET
VER. SCALE IN FEET
275+40
PROP ROUTE 16
CONST. BL
PROP HEADWALL
100-YR FLOODPLAIN
EL. 267.0
100-YR FLOODPLAIN
EL. 265.5
EXIST.
SHLD
EXIST GRADE (TYP)
PROP GRADE (TYP)
272.30
272.34
275+30
272.10
272.3
WETLAND
LIMIT
LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN
NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND
SEEDED WITH UPLAND SEED MIX


608491_E97_1(CULVERT PLAN).DWG Plotted on 15-Aug-2024 3:15 PM
MENDON
ROUTE 16
STATE
MA
FED. AID PROJ. NO.
-
SHEET NO.
29
TOTAL SHEETS
38
PROJECT FILE NO.
608491
CULVERT PLAN
NOTES:
1. SUPPORT OF EXCAVATION (SHEETING, PILES, ETC.) SHALL BE CUT OFF A MINIMUM OF 2 FEET BELOW PROPOSED GRADE IF LEFT IN PLACE.
2. SEE SHEET 32 FOR RETAINING WALL DETAILS.
3. SEE SHEET 34 FOR CONTROL OF WATER DETAILS AND HYDRAULIC DATA.
4. LIMITS OF EXISTING RETAINING HEADWALLS AND ANY ASSOCIATED FOOTINGS BELOW GRADE ARE UNKNOWN. SUPPORT OF EXCAVATION AS SHOWN MAY REQUIRE MODIFICATION TO AVOID CONFLICTS WITH EXISTING STRUCTURE.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE AND PROTECTION OF UNDERGROUND UTILITIES AND/OR STRUCTURES IN THE AREA OF CONSTRUCTION.
WORKING POINT TABLE
WORKING POINT | STATION | OFFSET
WP #1 | 275+40.00 | 19.54' LT
WP #2 | 275+14.45± | 19.72± LT
WP #3 | 275+10.38± | 19.76'± LT
WP #4 | 275+06.32± | 19.80'± LT
WP #5 | 274+80.00 | 20.17' LT
RETAIN EXIST. HEADWALL (TYP.)
STA. 275+09+75± OFFSET 40.83' RT
℄ CULVERT
EXIST. CULVERT
6'-0"±
RETAIN EXIST. CULVERT
40'-10"± EXIST. CULVERT
STA. 275+10.18±
℄ CONSTR.
275+00
89°24'12"±
DIRECTION OF FLOW
PROP. CONC. RETAINING WALL FOOTING (TYP.)
CONSTR. JT. (TYP.)
PROP. CONC. RETAINING WALL (TYP.)
PROP. S.O.E. AS REQ'D (TYP.) (CONTRACTOR DESIGN)
DEMO. EXIST. CULVERT AND HEADWALL (SEE NOTE 4)
PROP. S.O.E. OVER EXIST. CULVERT AS REQUIRED (CONTRACTOR DESIGN)
3'-0" MIN. DEMO. AND CONSTR.
19'-9"± EXIST. AND PROP. CULVERT
WP #1
WP #2
WP #3
WP #4
WP #5
90°0'0"
16'-0"
16'-0"
29'-9"±
30'-6"±
HEET 43
JNTOURS
GRADING
N
MUDDY BROOK CULVERT PLAN
SCALE 1" = 1'-0"

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	30	38
PROJECT FILE NO.		608491	

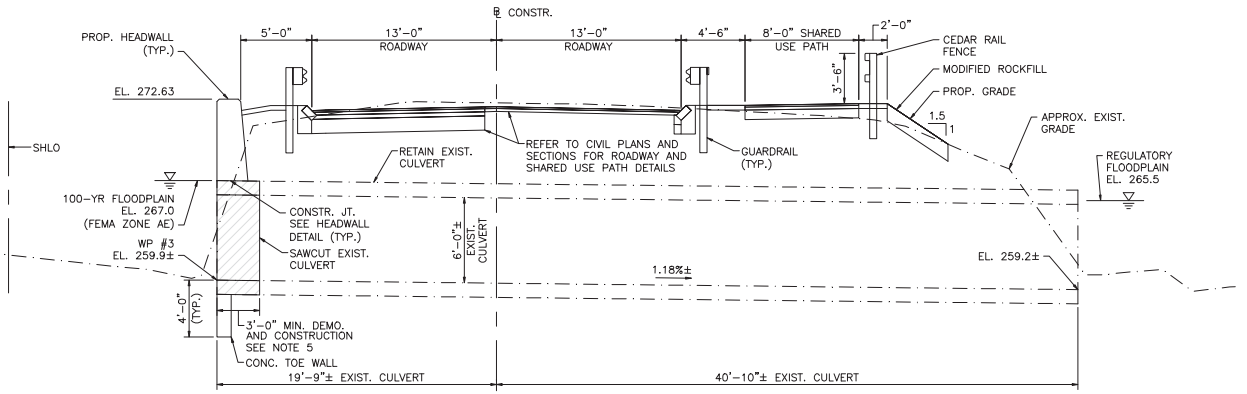
CULVERT ELEVATIONS



MUDDY BROOK CULVERT WEST ELEVATION

SCALE $\frac{1}{4}$" = 2'-0"

608491_EV7.3(CULVERT LONG SECTION).DWG Plotted on 13-Aug-2024 3:16 PM



MUDDY BROOK LONGITUDINAL SECTION
(LOOKING UP STATION)
SCALE 1/4" = 1'–0"

MENDON
ROUTE 16

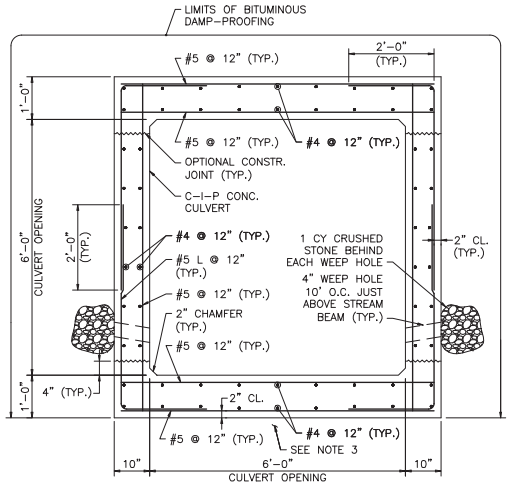
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	31	38
PROJECT FILE NO.		608491	

CULVERT LONG. SECTION AND DETAILS

NOTES:

1. ALL CONCRETE SHALL BE 4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE.
2. CULVERT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
3. TRANSVERSE REINFORCEMENT SHALL BE PLACED NORMAL TO THE CENTERLINE OF THE CULVERT.
4. DEMOLITION OF EXISTING CULVERT AT THE EAST END SHALL EXTEND A MINIMUM OF 3'-0" AS SHOWN. CULVERT DEMOLITION SHALL EXTEND TO SOUND CONCRETE SECTION BEYOND THE LIMITS OF CRACKING AND SPALLING TO THE EXISTING CULVERT.

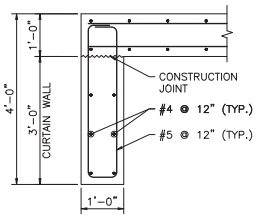
608491_EV7.3\CULVERT LONG SECTION.DWG Plotted on 13-Aug-2024 3:16 PM



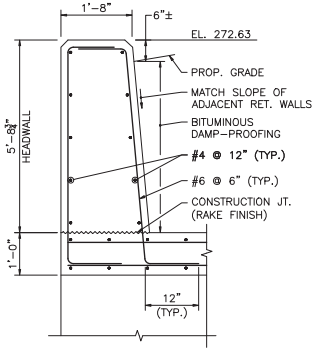
NOTES:

1. MAXIMUM FACTORED BEARING PRESSURE = 3 KSF.
2. FACTORED BEARING RESISTANCE = 6 KSF.

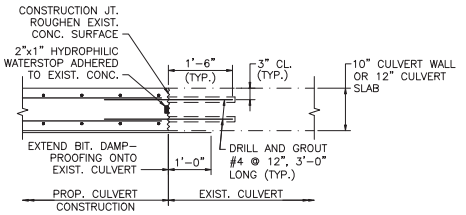
PROPOSED CULVERT SECTION
SCALE 3/4" = 1'–0"



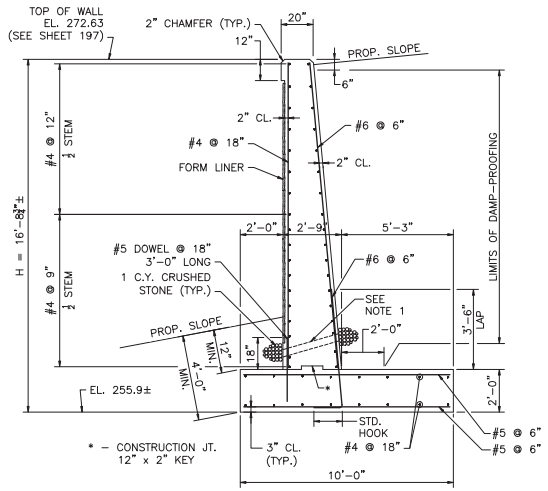
CURTAIN WALL DETAIL
SCALE 3/4" = 1'–0"



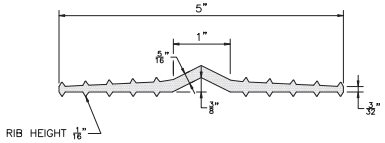
HEADWALL DETAIL
SCALE 3/4" = 1'–0"



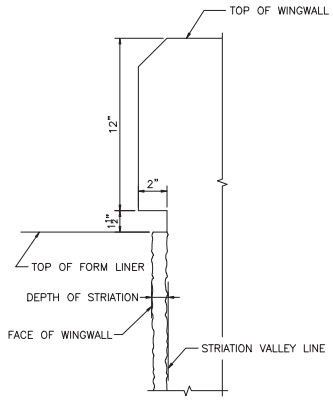
EXISTING CULVERT CONNECTION
SCALE 3/4" = 1'–0"



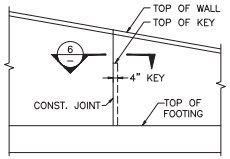
CULVERT RETAINING WALL SECTION
SCALE $\frac{3}{8}$" = 1'-0"



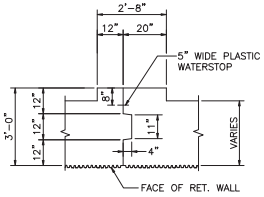
5" WATERSTOP
N.T.S.



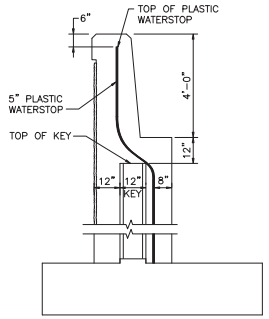
DETAIL AT TOP OF WINGWALL
SCALE: 3" = 1'-0"



WALL ELEVATION AT CONSTRUCTION JOINT
N.T.S.



SECTION 6
N.T.S.



NOTE:
REINFORCEMENT SHALL BE CONTINUOUS THROUGH CONSTRUCTION JOINTS.

VERTICAL SECTION THROUGH CONSTRUCTION JOINT
N.T.S.

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	32	38
PROJECT FILE NO.		608491	

CULVERT RETAINING WALL DETAILS

RETAINING WALL TYPICAL SECTION

1. 4"ø WEEP HOLES AT 10'-0" MAX. O.C. LOCATED 12" ABOVE THE HEEL OF FOOTING SLOPING 1" PER FOOT TOWARDS FRONT FACE. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
2. RETAINING WALL GEOMETRY AND REINFORCEMENT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO ORDERING MATERIALS OR STARTING WORK.
3. ALL CONCRETE SHALL BE 5000 PSI, 3/4 INCH, 685 HP CAST-IN-PLACE CEMENT CONCRETE. ALL REINFORCEMENT SHALL BE EPOXY COATED

RETAINING WALL DESIGN PARAMETERS

1. BACKFILL AND LOADING CONDITIONS:

   LEVEL BACKFILL
   279 PSF LIVE LOAD SURCHARGE

2. BACKFILL SOIL PROPERTIES

   ø = ANGLE OF INTERNAL FRICTION = 32°
   δ = ANGLE OF WALL FRICTION = 21°
   γ = EFFECTIVE UNIT WIGHT = 130 PCF

3. FOUNDATION SOIL PROPERTIES:

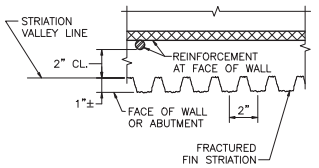
   FACTORED BEARING RESISTANCE = 15.0 KSF
   COEFFICIENT OF FRICTION = 0.62
   RESISTANCE FACTOR FOR SLIDING = 1.0

4. REINFORCED CONCRETE:

   f'c = 5,000 PSI
   Fy = 60,000 PSI

608491_LEV7-21(CULVERT MISC).DWG Plotted on 13-Aug-2024 3:12 PM

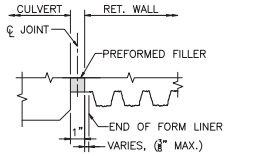
608491_LEV7-22\CULVERT MISC\.DWG Plotted on 13-Aug-2024 3:13 PM



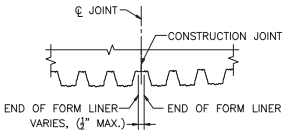
NOTES:

1. THE CONTRACTOR SHALL MAKE SURE THAT THE STRIATION FINS ARE PLUMB AND LINED UP VERTICALLY FROM PANEL TO PANEL FOR THE FULL HEIGHT OF THE WALL.
2. THE HORIZONTAL JOINT MAY BE OMITTED IF THE CONTRACTOR CAN DEMONSTRATE THAT THE FORM LINER PANELS CAN BE INSTALLED END TO END WITHOUT CREATING A VISIBLE SEAM IN THE FINAL CAST CONCRETE.

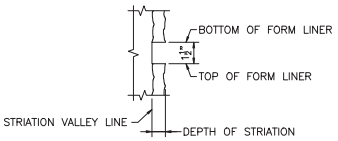
TYPICAL STRIATION DETAIL
SCALE: 3" = 1'-0"



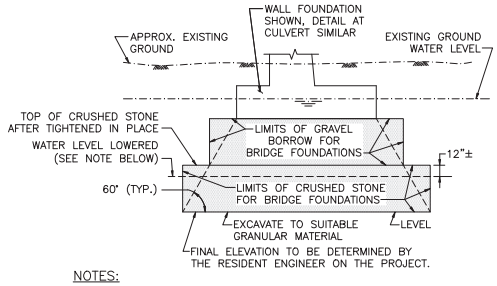
EXPANSION JOINT
SCALE: 3" = 1'-0"



CONSTRUCTION JOINT
SCALE: 3" = 1'-0"



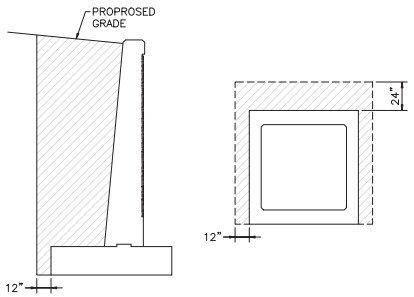
HORIZONTAL PANEL JOINT
SCALE: 3" = 1'-0"



NOTES:

1. LOWER WATER LEVEL AS MUCH AS POSSIBLE WITHOUT DISTURBING THE GRANULAR SOIL (SIDES AND BOTTOM) AND TIGHTEN THE CRUSHED STONE IN PLACE (SEE STANDARD SPECIFICATIONS).
2. REPLACE SOILS ABOVE ELEVATION 253.3 FEET BELOW PROPOSED CULVERT AND CULVERT RETAINING WALL FOUNDATIONS WITH CRUSHED STONE AND OR GRAVEL BORROW AS SHOWN AND PER SPECIFICATIONS.

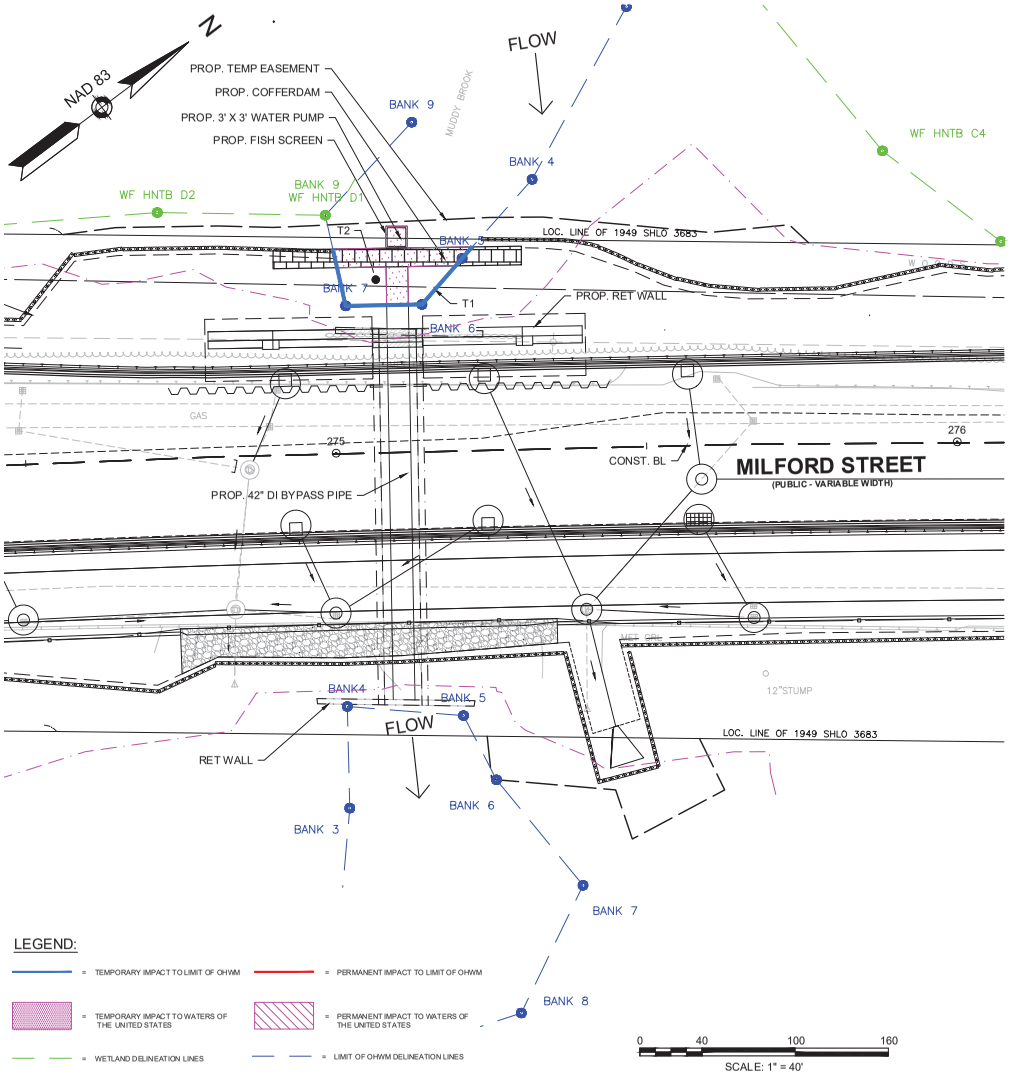
LIMITS OF CRUSHED STONE AND GRAVEL BORROW FOR WALL AND CULVERT FOUNDATIONS
N.T.S.



LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES
N.T.S.

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	34	38
PROJECT FILE NO.	608491		

CONTROL OF WATER



IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T1	TEMPORARY IMPACTS TO THE LIMIT OF OHWM DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	35 LF
T2	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	96 SQ. FT.

GENERAL UPSTREAM CULVERT HEADWALL REPLACEMENT NOTES:

1. THE WORK SHALL OCCUR ON ANY WEEKDAY MONDAY THROUGH FRIDAY. UNDER NO CIRCUMSTANCE WILL A DETOUR BE ESTABLISHED OVER THE WEEKEND WHICH INCLUDES FRIDAY NIGHT, ALL DAY SATURDAY AND SUNDAY.
2. ALL NECESSARY PERMITS FROM THE TOWN OF MENDON AND REGULATORY AGENCIES SHALL BE APPROVED PRIOR TO COMMENCEMENT OF WORK.
3. WATER LEVELS ARE SUBJECT TO CHANGE, THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS/HER OWN DETERMINATION OF WATER LEVELS THAT WILL EXIST DURING CONSTRUCTION.
4. UPON INSTALLATION AND INSPECTED ACCEPTANCE OF ALL SEDIMENT CONTROL MEASURES, THE CONTRACTOR SHALL BEGIN IMPLEMENTING THE STREAM DIVERSION AND DEWATERING PLAN.
5. CONTRACTOR IS RESPONSIBLE FOR INSTALATION OF A FISH PROTECTION SCREEN PRIOR TO THE START OF ANY DEWATERING ACTIVITIES.
6. CONTRACTOR IS RESPONSIBLE FOR CONDUCTING ALL DEWATERING ACTIVITIES DURING TIME OF YEAR (TOY) RESTRICTIONS AS REQUIRED BY MASSDEP.
7. PER OSHA REQUIREMENTS, CONTRACTOR TO PROVIDE A MINIMUM 10 FEET BETWEEN OPERATING EQUIPMENT, PRECAST PANELS ETC. AND OVERHEAD WIRES/UTILITY POLES.
8. INSTALL AN UPSTREAM/DOWNSTREAM COFFERDAM TO DIVERT THE FLOW OF WATER INTO THE BYPASS PIPE TO CREATE A DRY AREA ON THE DOWNSTREAM SIDE OF THE COFFERDAM. CONTRACTOR SHALL USE A WOVEN POLYPROPYLENE BAG COFFERDAM WITH BENTONITE LINING OR APPROVED EQUAL. CONTRACTOR MAY SUPPLEMENT COFFERDAM WITH TEMPORARY PRECAST CONCRETE BARRIER. CONTRACTOR TO USE A SLING TO LIFT BAG AND ONLY USE CLEAN PEA GRAVEL TO FILL BAGS. COFFERDAM HEIGHT SHALL BE 1 FOOT ABOVE THE DESIGN HIGH WATER ELEVATION FOR A TWO YEAR STORM OF 262.61'.

9.1 UPSTREAM WATER NOTES:
2-YEAR ELEVATION HEADWATER: 262.61'

9.2. WATER SURFACE ELEVATIONS AT DOWNSTREAM CULVERT:
100 YEAR FLOOD ELEVATION: 265.5'
10 YEAR FLOOD ELEVATION: 263.58'
WATER ELEVATION: 259.20'

EROSION AND SEDIMENT CONTROL SEQUENCE OF CONSTRUCTION NOTES:

1. PRIOR TO COMMENCEMENT OF LAND DISTURBING ACTIVITIES THE CONTRACTOR SHALL CONDUCT A MEETING ON SITE WITH THE TOWN OF MENDON AND MASSDOT TO DISCUSS THE APPROACH TO EROSION AND SEDIMENT CONTROL AND TO NOTE ANY SPECIAL CONDITIONS OR REQUIREMENTS FOR THE PROJECT.
2. PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITIES, INSTALL ALL PERIMETER EROSION CONTROL DEVICES AND THE CONSTRUCTION ENTRANCE. DISTURBANCE SHALL BE LIMITED TO THE MINIMUM REQUIRED TO INSTALL THE EROSION CONTROL MEASURES.
3. UPON APPROVAL OF INSTALLATION OF EROSION AND SEDIMENT CONTROL PERIMETER DEVICES, COMMENCE WITH SITE CLEARING AND GRUBBING ACTIVITIES.
4. STABILIZE ALL DENUDED AREAS WITHIN 7 DAYS OF DISTURBANCE WITH TEMPORARY OR PERMANENT VEGETATION AND SOIL STABILIZATION BLANKETS.
5. INSTALL UTILITIES AND GRADE IN ACCORDANCE WITH THE PLANS. CONSTRUCT PROPOSED DESIGN ELEMENTS INCLUDING PRECAST CULVERT, SIDE SLOPES AND ROADWAY IN ACCORDANCE WITH THE PLANS.
6. MAINTAIN SERVICE OF ALL EXISTING UTILITIES THROUGHOUT CONSTRUCTION. COORDINATE AND PLAN ANY UTILITY INTERRUPTIONS WITH THE TOWN OF MENDON.
7. MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES THROUGHOUT THE DURATION OF CONSTRUCTION. NO AREA SHALL REMAIN DENUDED MORE THAN 7 DAYS WITHOUT STABILIZATION.
8. INSPECT CONTROLS ON A WEEKLY BASIS AND AFTER EVERY STORM EVENT, ESPECIALLY AT THE PERIMETER. REPAIR ALL DAMAGED DEVICES IMMEDIATELY. COST OF REPAIR OF DAMAGED CONTROLS IS INCIDENTAL TO THE CONTRACT.

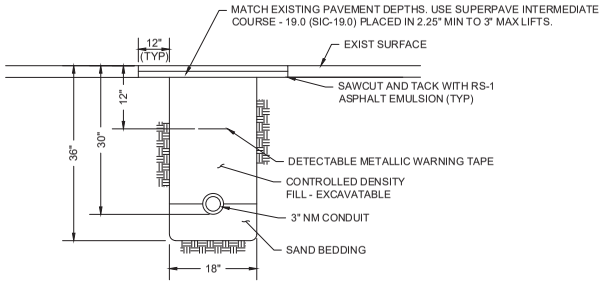
GENERAL CONSTRUCTION STAGING NOTES:

1. NO STAGING OR STOCKPILE AREAS SHALL BE ALLOWED IN THE 100 YEAR FLOODPLAIN OR ANY OTHER ENVIRONMENTALLY SENSITIVE AREA. THE 100-YEAR FLOODPLAIN ELEVATION IS ASSUMED TO BE ELEVATION 265.5 ON DOWNSTREAM SIDE AND 267 ON UPSTREAM SIDE. CONTRACTOR SHALL COORDINATE LOCATION AND SIZE OF PROSPECTIVE CONSTRUCTION LAYDOWN AREA PRIOR TO COMMENCEMENT OF WORK AND OBTAIN APPROVAL WITH THE TOWN OF MENDON. ALL WORK STORAGE, OR ANY OTHER STAGING AREAS SHALL BE STABILIZED AS NECESSARY DURING CONSTRUCTION AND UNPAVED TRAFFIC AREAS SHALL BE MATTED OR GRAVELED AND ALL CONSTRUCTION EQUIPMENT USED WITHIN THE STREAM DIVERSION MUST BE PLACED ON MATS.
2. AT THE CONTRACTORS PREFERENCE, AN ALTERNATIVE SEQUENCE OF CONSTRUCTION MAY BE PROPOSED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING THE APPROPRIATE PLANS AND REQUEST IN WRITING FOR A CHANGE TO THESE PLANS AND OBTAIN APPROVAL BY MASSDOT. NO ADDITIONAL COMPENSATION WILL BE ALLOWED FOR DELAYS CAUSED BY THE REVIEW AND APPROVAL PROCESS NOR WILL ADDITIONAL COMPENSATION BE ALLOWED IF ANY PROPOSED CHANGE IS REJECTED. MASSDOT AND OTHER PERMITTING AGENCIES SHALL DETERMINE WHETHER ANY PROPOSED ALTERNATE SEQUENCE IS ACCEPTABLE. IF NO ALTERNATE IS FOUND ACCEPTABLE THEN THE SEQUENCE SHOWN ON THESE PLANS SHALL BE FOLLOWED. CONTRACTOR SHALL SUBMIT PLANS AND CONSTRUCTION SEQUENCE FOR DEWATERING A TWO YEAR STORM AS STATED IN THE MASSDOT BRIDGE MANUAL.
3. ALL LAND WHICH IS DISTURBED BY THE CONTRACTOR, AND WHICH IS NOT BUILT UPON OR SURFACED, SHALL BE ADEQUATELY STABILIZED TO CONTROL EROSION AND SEDIMENTATION IN CONFORMANCE WITH THE CURRENT MASSDOT AND TOWN OF MENDON GUIDELINES.
4. THE DIVERSION IS NOT INTENDED TO BLOCK HIGHWATER EVENTS FROM FLOODING THE DEWATERED AREAS. NO EQUIPMENT OR UNSECURED MATERIALS WILL BE ALLOWED OVERNIGHT WITHIN THE STREAM BANKS IN CASE FLOODING OCCURS.
5. ALL PLACEMENT, ADJUSTMENTS, ETC. OF THE STREAM DIVERSION SHALL BE PERFORMED WHILE OBSERVING ANY IN-STREAM WORK RESTRICTIONS.
6. THE COST OF THE STREAM DIVERSION AND REQUIRED EQUIPMENT (PIPE, RIPRAP OUTLET PADS, PUMPS, SAND BAGS, ETC.) IS TO BE CONSIDERED INCIDENTAL TO ITEM 991.1 CONTROL OF WATER.
7. MATERIAL FOR CONSTRUCTION OF ANY KIND SHALL NOT BE STAGED WITHIN 100 FEET OF A WETLAND RESOURCE AREA THROUGHOUT THE DURATION OF CONSTRUCTION.
8. PRIOR TO COMMENCEMENT OF CULVERT WORK, DOWNSTREAM AREA SHALL BE PROTECTED FROM SCOUR AND POTENTIAL VELOCITY-INDUCED EROSION THROUGH THE INSTALLATION OF A TEMPORARY CONCRETE SCOUR PAD (4'X10'X6").
9. CONTRACTOR TO SUBMIT PLAN FOR DEWATERING WITHIN IN THE COFFERDAM ON THE UPSTREAM SIDE.

608491_EV10\CONTROL OF WATER.DWG Plotted on 12-Dec-2024 9:11 PM
Proposal No. 608491-131468
A000830 - 154

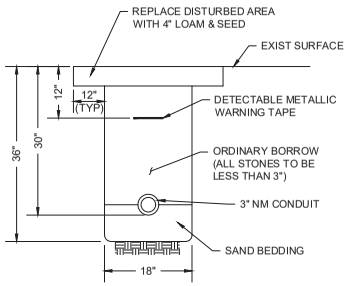
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	35	38
PROJECT FILE NO.		608491	

CONSTRUCTION DETAILS
SHEET 1 OF 4



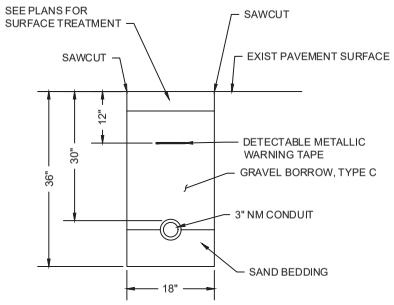
CONDUIT IN CROSSING ROADWAY
NOT TO SCALE

NOTES:
1. TEMPORARY PATCHING WITHIN MILL AND OVERLAY AREAS SHALL BE PAID FOR UNDER ITEM 451.
2. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. CONTROL DENSITY FILL SHALL MEET THE REQUIREMENTS OF MASSDOT MATERIAL SPECIFICATION M4.08.0.
4. WARNING TAPE SHALL BE PER CURRENT AMERICAN PUBLIC WORKS ASSOCIATION STANDARDS.



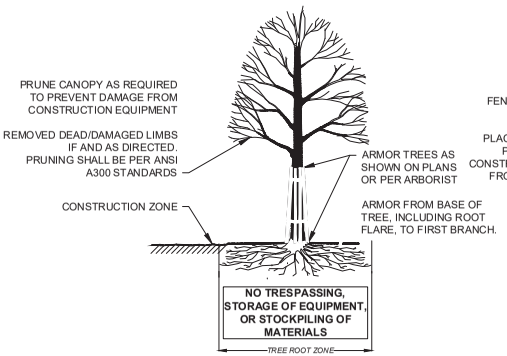
CONDUIT IN GRASS
NOT TO SCALE

NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.



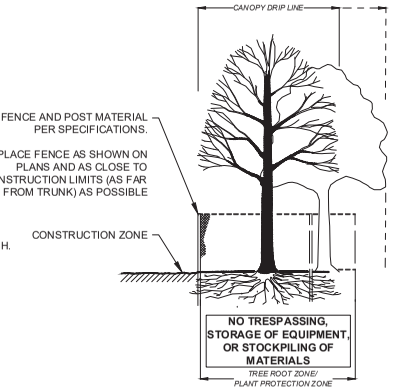
CONDUIT IN SIDEWALK
NOT TO SCALE

NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.

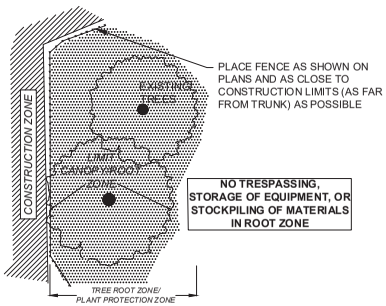


SECTION - TRUNK ARMORING & PRUNING

TREE PROTECTION - TRUNK
NOT TO SCALE

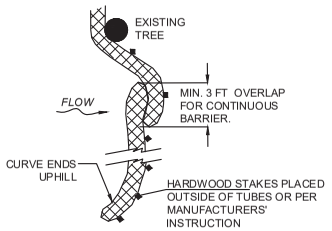


SECTION - FENCE PROTECTION OF ROOT ZONE



PLAN VIEW - FENCE PROTECTION OF ROOT ZONE

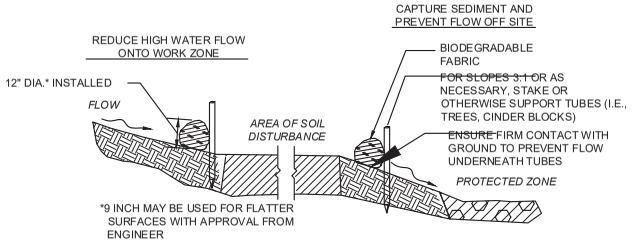
TREE PROTECTION - ROOT ZONE
NOT TO SCALE



PLACE TUBE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE, ALONG CONTOURS, AND PERPENDICULAR TO FLOW.

ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLAN VIEW



*9 INCH MAY BE USED FOR FLATTER SURFACES WITH APPROVAL FROM ENGINEER

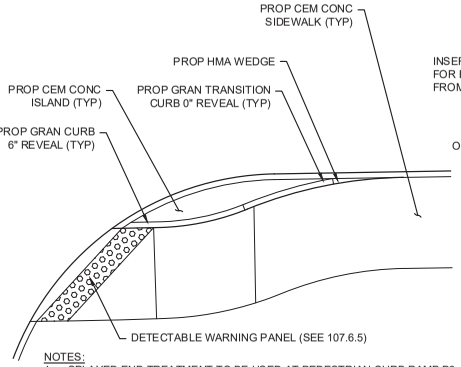
SECTION

SEDIMENT CONTROL BARRIER
NOT TO SCALE

608491_EVACONST DETAILS3.DWG Plotted on 12-Dec-2024 8:29 PM

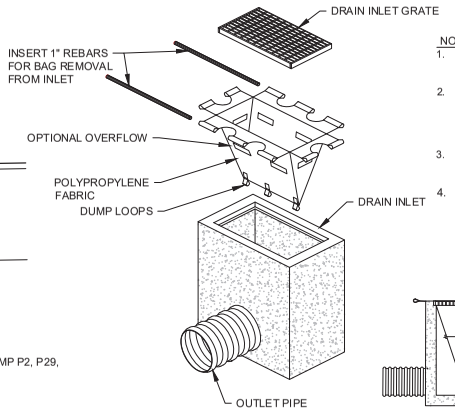
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	36	38
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 2 OF 4



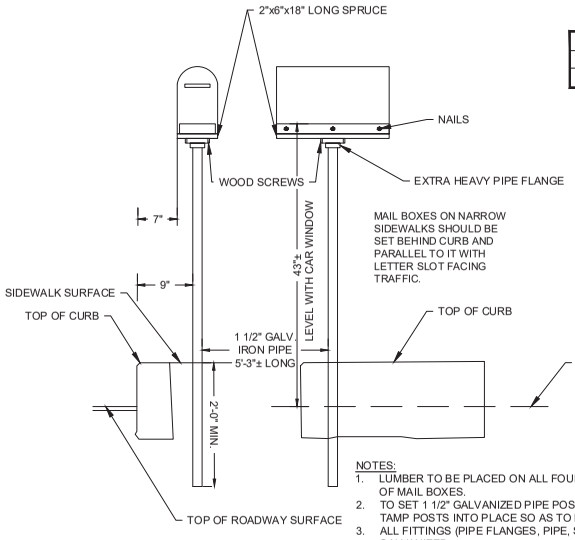
NOTES:
1. SPLAYED END TREATMENT TO BE USED AT PEDESTRIAN CURB RAMP P2, P29, P30 & P32.

SPLAYED END CURB TREATMENT
NOT TO SCALE



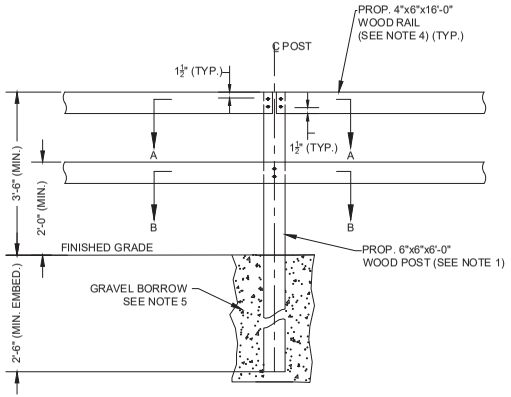
NOTES:
1. INSTALL DRAIN INLET PROTECTION PER MANUFACTURER'S SPECIFICATIONS.
2. REMOVE DRAIN INLET GRATE AND INSTALL POLYPROPYLENE FABRIC OVER DRAIN INLET FRAME. REPLACE DRAIN INLET GRATE TO SECURE POLYPROPYLENE FABRIC IN PLACE.
3. LENGTH AND WIDTH SHALL BE MANUFACTURED TO FIT THE OPENING OF THE DRAIN INLET.
4. MAINTENANCE: REMOVE ALL ACCUMULATED SEDIMENT AND DEBRIS FROM SURFACE AND VICINITY OF UNIT AFTER EACH STORM EVENT. REMOVE SEDIMENT THAT HAS ACCUMULATED WITHIN THE CONTAINMENT AREA OF THE DRAIN INLET PROTECTION SACK AS NEEDED.

TYPICAL DRAIN INLET PROTECTION
NOT TO SCALE

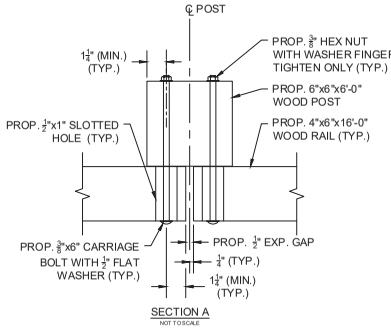


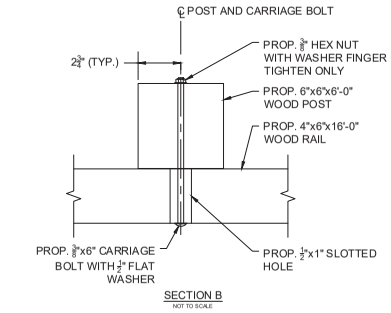
NOTES:
1. LUMBER TO BE PLACED ON ALL FOUR SIDES TO FULL 2"x6" SIZE TO FIT BOTTOM OF MAIL BOXES.
2. TO SET 1 1/2" GALVANIZED PIPE POST, USE DRIVING POINT OF SAME SIZE, THEN TAMP POSTS INTO PLACE SO AS TO BE PLUMB BOTH WAYS.
3. ALL FITTINGS (PIPE FLANGES, PIPE, SCREWS, NAILS, ETC.) ARE TO BE GALVANIZED.
4. FOR DESCRIPTIONS, MATERIALS, AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.
5. A 4"x4" PRESSURE TREATED WOOD POST MAY BE SUBSTITUTED FOR A PIPE POST.

RESIDENTIAL MAILBOX
NOT TO SCALE

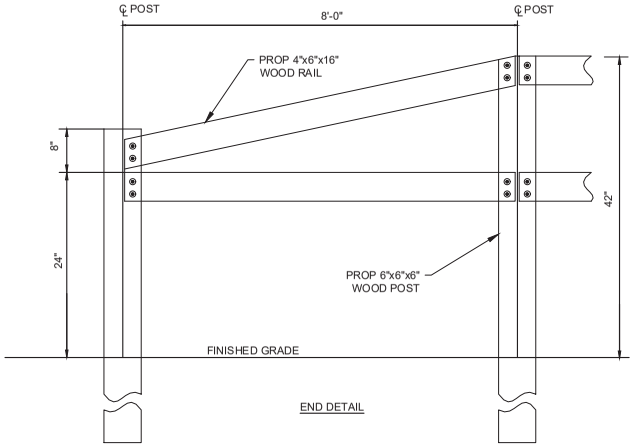


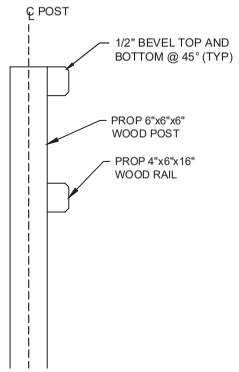
WOOD RAILING DETAIL
NOT TO SCALE





WOOD RAILING
NOT TO SCALE



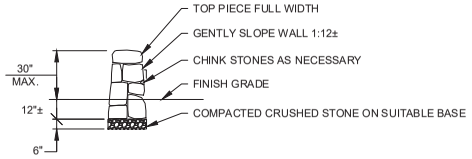


NOTES:
1. POSTS SHALL BE PLACED 8'-0" ON CENTER.
2. THE FACE OF RAIL SHALL BE SET OFF THE EDGE OF BIKE PATH PAVEMENT, AS SHOWN ON THE PLANS, AND AS DIRECTED BY THE ENGINEER.
3. ALL HARDWARE SHALL BE GALVANIZED.
4. ALTERNATE JOINTS IN RAILING BETWEEN POSTS
5. CONTRACTOR SHALL SET POST IN 4,000 PSI, 1-1/2IN, 565 CEMENT CONCRETE FOR ALL POSTS UNABLE TO BE SET AT REQUIRED DEPTH.
6. THESE RAILS SHALL ONLY BE INSTALLED BETWEEN POSTS ADJACENT TO RETAINING WALL LOCATIONS.

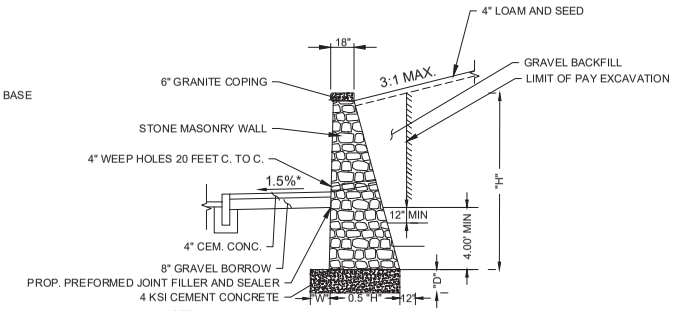
608491_EVA\CONST DETAILS3.DWG Plotted on 12-Dec-2024 8:29 PM

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	37	38
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 3 OF 4

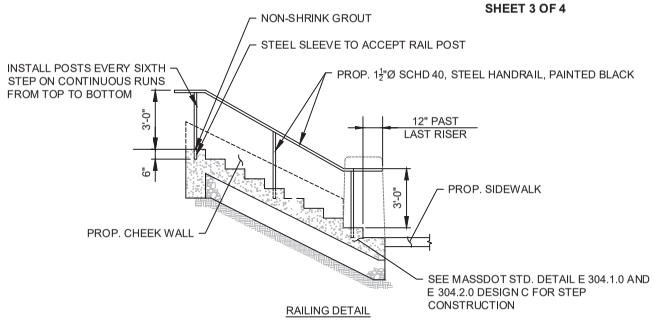


R&R BALANCE STONE WALL
NOT TO SCALE



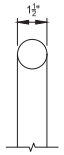
NOTE:
1. SEE MASSDOT STANDARD DETAIL E 302.2.0 FOR FURTHER INFORMATION.
2. H, D AND W ALL VARY DEPENDING ON STANDARD DETAIL E 302.2.0.

WALL TYPE - LOW CEMENTED STONE MASONRY RETAINING WALL
NOT TO SCALE

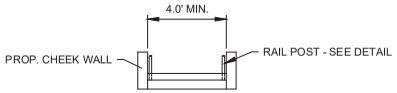


RAILING DETAIL

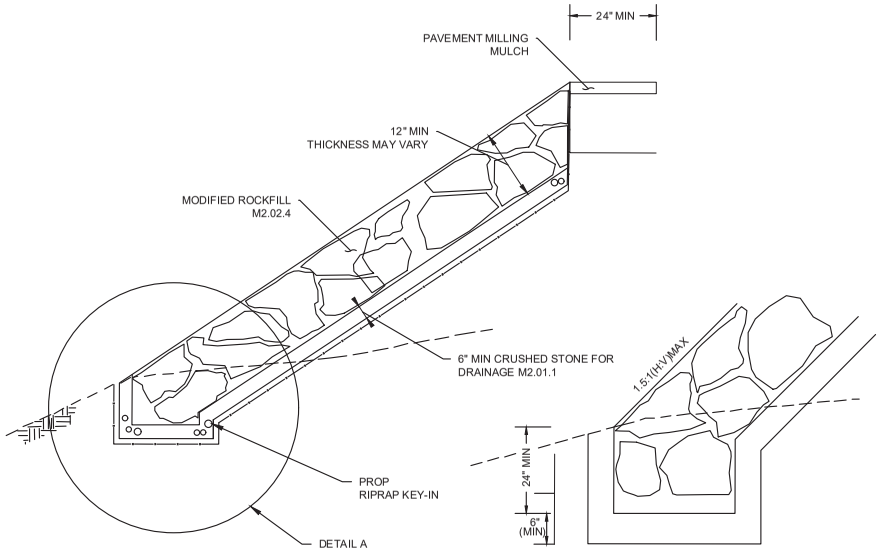
CEMENT CONCRETE STEPS & HANDRAIL DETAIL
NOT TO SCALE



HANDRAIL
NOT TO SCALE

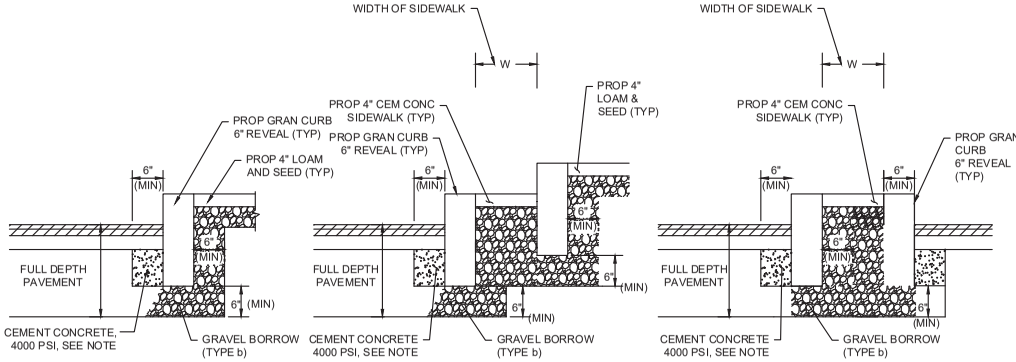


HANDRAIL - SECTION
NOT TO SCALE



KEY-IN DETAIL A

MODIFIED ROCKFILL
NOT TO SCALE



GRANITE CURB, TYPE VB, IN FULL DEPTH PAVEMENT
NOT TO SCALE

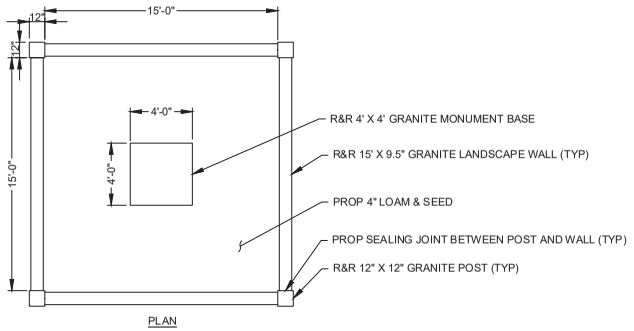
GRANITE CURB, TYPE VB, IN FULL DEPTH PAVEMENT & BACK OF SIDEWALK
NOT TO SCALE

GRANITE CURB, TYPE VB, IN FULL DEPTH PAVEMENT & BACK OF SIDEWALK WITH PARKING LOT
NOT TO SCALE

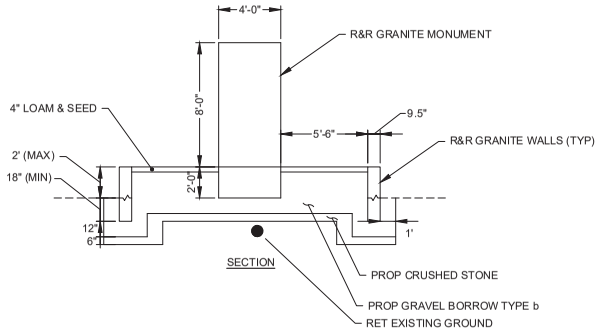
608491_EVA\CONST DETAILS3.DWG Plotted on 12-Dec-2024 8:29 PM

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CONSTRUCTION DETAILS
SHEET 4 OF 4



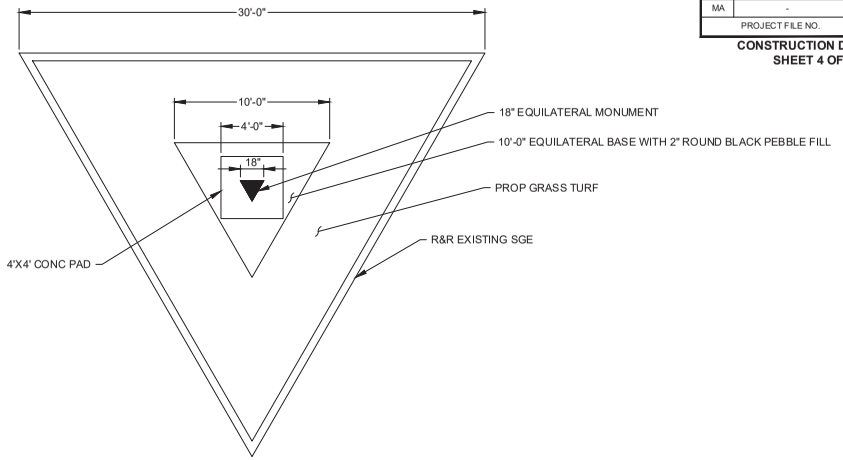
PLAN



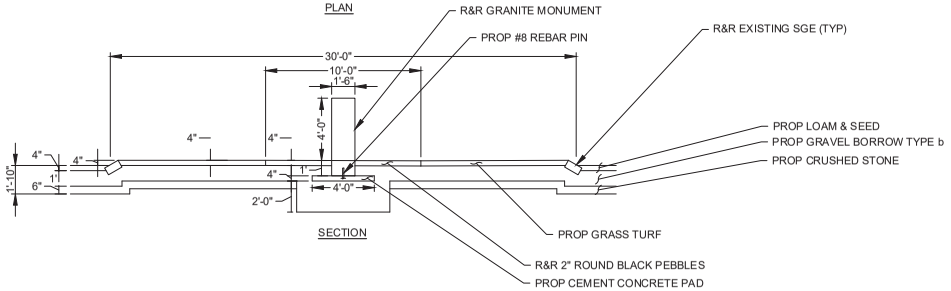
MONUMENT #1
NOT TO SCALE

MONUMENT #1 NOTES:

1. DIMENSIONS FOR MONUMENTS ARE APPROXIMATE AND CONTRACTOR TO RELOCATE MONUMENTS IN KIND.
2. MONUMENT "A" IS TO HAVE ALL WALLS AND POSTS REMOVED AND RESET TO THE NEW LOCATION.
3. COLORED JOINT SEALANT TO BE USED WHERE GRANITE POST AND WALLS JOIN TOGETHER.
4. CONTRACTOR TO PROVIDE ORDINARY BORROW, GRAVEL BORROW, CRUSHED STONE & LOAM AND SEED WHERE NECESSARY FOR BOTH MONUMENTS.
5. CONTRACTOR TO SET THE GRANITE POSTS AND WALLS USING ITEM 901. (4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE).
6. MONUMENT "A" TO BE SET BY CONTRACTOR PRIOR TO POURING OF CONCRETE SURROUNDING PLAZA.



PLAN



SECTION

MONUMENT #2
NOT TO SCALE

MONUMENT #2 NOTES:

1. DIMENSIONS FOR MONUMENTS ARE APPROXIMATE AND CONTRACTOR TO RELOCATE MONUMENTS IN KIND.
2. EXISTING SLOPED GRANITE EDGING AND LANDSCAPE LIGHTING AT MONUMENT "B" TO BE REMOVED AND RESET AT NEW LOCATION. LIGHTING IS SOLAR POWERED AND NO HARDWIRING IS INCLUDED.
3. MONUMENT "B" TO HAVE NEW OUTDOOR ARTIFICIAL TURF AND BLACK 2" ROUND PEBBLES INSTALLED TO BE REUSED FROM EXISTING MONUMENT.
4. COLORED JOINT SEALANT TO BE USED WHERE GRANITE POST AND WALLS JOIN TOGETHER.
5. CONTRACTOR TO PROVIDE ORDINARY BORROW, GRAVEL BORROW, CRUSHED STONE & LOAM AND SEED WHERE NECESSARY FOR BOTH MONUMENTS.
6. CONTRACTOR TO FORM A NEW CONCRETE PAD (4'X4' & 4" DEPTH) FOR MONUMENT "B" BY USING ITEM 901. (4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE).
7. A #8 BAR TO BE SET IN THE CONCRETE PAD SO THAT THE MONUMENT STRUCTURE CAN REST IN PLACE. NO ADHESIVE IS REQUIRED TO ADHERE THE MONUMENT WITH THE CONCRETE PAD.

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Proposal No. 608491-131468

Appendix D –Stormwater Management Report

Uxbridge – Mendon Route 16

Resurfacing and Related Work on Route 16

(100% Submission)

Project No. 608491

Stormwater Report

Prepared for:

Massachusetts Department of Transportation
Highway Division

December 2023

Prepared by
HNTB Corporation

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1. Introduction

1.1 Objectives of Report

This report provides the background and technical information to demonstrate how the Project's proposed drainage and stormwater management systems comply with Chapter 8 Drainage and Erosion Control of the MassDOT Highway Design Guide and the ten Massachusetts Stormwater Standards.

1.2 Project Description

The Massachusetts Department of Transportation (MassDOT) proposes resurfacing and related work along Route 16 in the Town of Mendon from Taft Avenue to the Hopedale town line. Route 16 is a major roadway that runs through Mendon and experiences safety concerns at the intersections and heavy traffic volumes, especially during morning and afternoon rush hours.

The related work includes the addition of a shared use path on the south side of the road, improvements to the existing sidewalk on the north side, along with intersection improvements, two new traffic signals at Hartford Avenue West and Maple Street, and a signal upgrade at North Avenue. The purpose of these roadway improvements is to increase safety and mobility for both vehicles, cyclists, and pedestrians.

The roadway improvements include 11' travel lanes, an 8' shared use path, and a 4' grass buffer. The culvert at Muddy Brook will be extended to accommodate the widening of the Right-of-Way. The project will require modifications to the existing drainage system to align with the new Right-of-Way and provide stormwater management improvements that mitigate the additional impervious surface.

The total project length is roughly two miles. The project begins approximately 200 feet south of Taft Avenue and ends approximately 250 feet north of Harrington Street.

Note: Unless noted otherwise all elevations presented in this document are referenced to the North American Vertical Datum of 1988 (NAVD 88). See the Locus Map provided in Appendix A for project location.

1.3 Stormwater Management and Drainage Design

The following highlights the key general criteria that the project design has followed.

- The proposed stormwater system through the project corridor has been designed to match existing drainage patterns and layout as closely as possible to minimize the

impacts to adjacent properties, resource areas, and existing roadway. Existing catch basins, drain manholes, cross culvert and outfalls have been utilized to the maximum extent practicable.

- Hydraulic pipe sizing calculations have been performed using StormCAD CONNECT Edition Update 3 to ensure all existing and proposed pipes will sufficiently convey the 10-year design storm.
- Spread calculations have been performed to ensure that the width of gutter flow during the 10-year design storm meets the required spread criteria outlined in 2006 MassDOT Project Development & Design Guide, Chapter 8.
- Stormwater runoff from most of the proposed project will drain via gutter to catch basins, enter a pipe conveyance system, and be directed to existing outfalls, as well as infiltration measures to the greatest extent practicable within the project limits.
- Catch basins have been proposed at maximum spacing of 300 ft. Catch basins on the inside of superelevated curves are spaced at a maximum of 250 feet.
- BMP measures have been proposed where appropriate for the project, targeting areas with available right-of-way, and aiming to mimic existing stormwater flow patterns to the greatest extent practicable. These BMP measures, including an infiltration basin, sediment forebays, and grass channels (and further described in Section 3.3) will infiltrate stormwater runoff to recharge groundwater and improve the water quality and reduce peak flows to downstream resources.

1.4 Redevelopment Project

The proposed project is classified as a redevelopment project because the Project provides safety improvements to an active state highway. As a redevelopment project, the project is required to meet the MA DEP Standards 2, 3, 4, and 6 to maximum extent practicable.

For Standard 2, regarding peak flow rate mitigation, larger surface basins will provide a measure of peak flow reduction, but not for a significant portion of project runoff. The small project footprint and right-of-way constraints limited the ability to provide any additional detention for peak rate mitigation.

For Standard 3, regarding ground water recharge, the surface basins will satisfy the Required Recharge Volume in excess of the project site's increase to impervious area for a Target Depth Factor congruent to NRCS Hydrologic soil type B (refer to Appendix E's Required Recharge Volume Calculation). Most of the southern portion of the site is within NRCS Hydrologic soil type C, based on available NRCS Soil Survey mapping, but there are pockets of HSG A, and much of the northern portion of the site is within the boundaries of HSG B. Therefore, HSG soil type B was selected for the overall recharge analysis.

For Standard 4, regarding water quality improvement, the surface basins will satisfy the Required Water Quality Volume for the redevelopment by either effectively storing 1-inch of runoff over the contributing impervious areas or providing TSS removal via conveyance BMPs prior to discharge (refer to Appendix E for Required Recharge Volume Calculation and WQV Delineations). While only a portion of the project discharges to a Special Resource Water (The Muddy Brook is listed as a Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), a water quality volume of 1 inch is assumed for all infiltration measures within the project limits. Surface basins were selected as the designed Best Management Practice because they provide groundwater recharge and improved water quality, which are parameters that have the greatest potential to improve the conditions of the specific adjacent environmental resources.

2 Existing Drainage Conditions

2.1 Topography and Land Use

Route 16 is a 59.9-mile Massachusetts state highway from Route 12 in Webster to the intersection of Route 1A and Route 60 in Revere. In the project area, Route 16 runs east-west from Taft Avenue in Mendon to the Hopedale town line. The land surrounding the project corridor is a mix of residential, commercial, and recreational uses.

2.2 Floodplains / Water Surface Elevations

The project area includes the FEMA 100-year floodplain associated with Muddy Brook. The FEMA Flood Zone Map is included in Appendix A.

2.3 Environmental Resources

Based on an environmental review of the project, multiple natural resource areas were identified within or adjacent to the project area. Three wetlands were identified within the project area and one perennial stream within 200 ft of the project area. The stream crossing was identified as Muddy Brook (STA 275+00). The Muddy Brook is listed as a Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife. The FEMA Flood Zone Map for the Muddy Brook is included in Appendix A. Two open space parcels were identified as being within or adjacent to the project area: Town of Mendon Founders Park located at the Southwest corner of Route 16 and Main Street and the Muddy Brook North Conservation Area bordering the project to the Northwest near the Muddy Brook crossing. An IPaC review for the project identified the Northern Long-eared bat as a federally listed species within the project area. The project does not fall within the area of priority or estimated habitat, but if any tree clearing is included in the project, agency coordination may be required. No Areas of Critical Environmental Concern or vernal pools were identified within

the project corridor. There are several properties identified on the National Registry of Historic Places along the project within the Mendon Center Historic District.

2.4 Surficial Geology Soils

The USDA-NRCS WSS for Hampden County identified 12 mapped soil units within 200 ft of the project area. Three highly erodible soils were identified within the project area. Two hydric soils were identified within the project area. Three soils are classified as predominantly hydric. Hydric soils can be indicative of the presence of wetland communities, which appears to be the case for the project area – flagged wetlands are present in areas of hydric soils.

Hydrologic Soil Groups are determined by the water transmitting soil layer with the lowest saturated hydraulic conductivity and depth to any layer that is more or less water impermeable, or depth to a water table. The least transmissive layer can be any soil horizon that transmits water at a slower rate relative to those horizons above or below it. The slop of the soil surface is not considered when assigning hydrologic soil groups. Refer to Appendix A for the NRCS Web Soil Survey Map.

2.5 Existing Drainage Areas

There are eight existing drainage areas that discharge to existing outfalls located at low points along Route 16. In the first two-thirds of the project, stormwater runoff is captured by a series of catch basins along the gutter line of the road and conveyed through a network of closed pipes. The largest drainage area in the project leads to the Muddy Brook culvert.

3 Proposed Drainage Conditions

3.1 Engineering Methods

Drainage system design is dependent on a calculation of the magnitude, volume, and distribution of storm runoff for a given design storm. A hydrologic and hydraulic analysis was performed for the proposed drainage system. Precipitation data was obtained from the National Oceanic and Atmospheric Association's (NOAA) Atlas 14-point precipitation frequency estimates (See Appendix A). The Rational Method was used to calculate proposed flows and time of concentration was calculated using SCS TR-55 method. In addition to the closed drainage system, the project will also include BMP systems as described in Section 3.3 (and including infiltration basins, grass channels, and sediment forebays) and deep sump catch basins to further enhance the quality of runoff as prescribed in DEP's Stormwater Management Handbook. The Rational Method is used to compute storm runoff flow rates from the contributory areas along the Project corridor, gutter spread widths, flow velocities and hydraulic grade lines for pipe sizing. See Appendix C for pertinent computations pertaining to the placement of catch basins to minimize spread into the travel way and the

sizing of drainage pipes.

3.2 Proposed Drainage Design and Layout

The drainage areas for each inlet were approximated and drawn using AutoCAD 2021. Existing ground contours from the project field survey were used along with GIS contours for off-site areas to establish existing flow patterns and watersheds.

The Rational Method was used to estimate peak stormwater runoff for the 10-year design storm. The Q10 was calculated for the MassDOT roadway drainage requirement and the Q100 was calculated as a design safety check. Time of concentration (Tc) calculations were based on the Technical Release No.55 (TR-55) "Urban Hydrology for Small Watersheds" by the United States Soil Conservation Service (SCS) method for sheet, shallow concentrated and channel flow. Appendix B includes the Catchment Area Plans, Catchment Area Calculations and the Time of Concentration Calculations.

Spread and by-pass flow calculations were performed to ensure that spread width meets the MassDOT standard requirements. The roadway is qualified as urban arterial. The criteria states that the design spread for the 10-year runoff frequency shall be the shoulder width plus 3 feet. A minimum spread width of 6 feet was used. Catch basin layout within the proposed stormwater system has been designed to meet this requirement except where noted in the calculations included in Appendix C.

The storm drain system was analyzed using StormCAD. The hydraulic grade line (HGL) was calculated at each structure to ensure the level of flooding experienced during the design storm event was contained within the structure. The depth to HGL is contained within the structure at all locations. Existing structures downstream of the proposed system were modeled as outfalls. In StormCAD, the outfall would normally be set to "free outfall" which allows the model to calculate the starting depth based on system flow. However, for this design analysis, the outfall condition was set to a tailwater condition with the water elevation being set to the top of the outfall pipe. This provides a conservative estimate to account for the potential for existing outfalls to be under water. Appendix D includes the Pipe Sizing calculations.

Existing pipes and structures were maintained to the maximum extent possible. The physical constraints of this existing drainage system limited the flexibility of the proposed design. Proposed pipes were placed at the lowest elevation possible to maximize cover, meet all corresponding existing downstream inverts and adhere to the MassDOT standards.

Assumptions:

- The existing system being retained is in good condition
- The existing system shall remain in use during construction
- The 10-year storm event was the basis for analysis of the closed drainage system
- Time of concentration for all inlets is a minimum of five minutes
- No additional flow shall be intercepted by the system

There are some catch basins where the spread width is beyond the MassDOT standards. In most cases, the exceedance is minimal, or concentrated at low points on side streets where fine grading may still be adjusted.

3.3 Proposed Best Management Practices (BMPs)

The Project proposes the following improvements in stormwater management over the existing conditions:

- Deep sump catch basins
- Sediment Forebay for pre-treatment with an open-graded infiltration basin
- Grassed channels with sediment forebays and checkdams for collection and treatment of runoff

All runoff will flow into deep sump catch basins or vegetated conveyance channels, which is an improvement to existing conditions where there are now only standard catch basins.

There are two open graded BMP areas within project limits. These BMP areas are strategically located at or near areas that are both low point in the roadway profile, and within areas that have the available right of way (and lack of established vegetation) to install the proposed best management practices. See Appendix E for the location of the proposed BMPs.

Open Graded Best Management Practices:

All proposed infiltration and BMP measures are modelled using HydroCAD. The model computes the peak discharges through outlets and determines the maximum high water elevation during storm events. This method calculates runoff rate using time of

concentration, curve number, catchment acreage, and 24-hour precipitation for the selected return period and rainfall distribution. Rainfall data for the storm events is estimated from the NOAA Atlas 14, Volume 10, Version 3 Rainfall data. The 2-year, 24 hour storm for the project area is 3.37 inches; the 10-year, 24 hour storm is 5.21 inches; and the 100-year, 24 hour storm is 8.14 inches. The rainfall data is included as Appendix A, and the HydroCAD model is included in Appendix E.

Curve numbers represent the relative permeability of local soil types, with 98 equal to the most impermeable pavement surfaces. Permeable areas are assigned curve numbers according to the hydrologic code of the soil type (A, B, C, or D). the CN values assigned to the contributing pervious areas in each catchment are based on the available SSURGO mapping, and according to the HSG specified for each soil type. Within the areas of focus, this varies from HSG A to HSG C.

Times of concentration demonstrate the longest time that it takes runoff to drain from any point in a catchment area to the discharge. Depending on the characteristics of the flow path, the time of concentration calculation will include some combination of sheet flow, shallow concentrated flow, flow in a pipe, or channel flow. Sheet flow lengths are limited to a maximum 100 feet. The minimum time of concentration is five minutes, or 0.083 hours. Most of the catchment areas within the project are found to have times of concentration less than the minimum five minutes. Time of concentration calculations are included as part of the Drainage Calculations in Appendix B if the time is over the minimum of 5 minutes.

BMP Area 1:

The proposed location for this best management practice is at the western end of the project, near Uxbridge Road's intersection with Hartford Avenue West and stretching from approximately Station 206+00 to Station 209+00, on the north side of the roadway. It consists of a series of surface basins, connected via overflow by a graded grass channel. The most upstream basin is sized as an infiltration basin, including an associated sediment forebay. This location receives the majority of the runoff for this BMP, picking up flow from the existing drain main across the street. The infiltration basin (and associated sediment forebay) is designed to provide recharge and water quality volume for the entire contributing drainage area.

The infiltration basin then overflows to a graded grass channel downstream, which provides further treatment and potential for infiltration for the overflow from the infiltration basin. A small portion of the roadway is also graded toward this channel, providing for country drainage along most of its length. The grass channel terminates in a small sediment forebay downstream, providing another opportunity for any remaining pollutants to settle and

runoff to infiltrate, before discharging either to the closed drainage system (via a catch basin overflow) or overland before eventually reaching an existing stream. The catch basin is designed as the lower outlet, to minimize runoff to the environmentally sensitive areas surrounding the basin discharge.

BMP Area 2:

The proposed location for this best management practice is at the midpoint of the project, near the existing Muddy Brook Culvert, and stretching from approximately Station 268+25 to 270+50. It consists of a series of two surface basins, connected via overflow by a graded grass channel. The overflow from the second surface basin connects to an existing 'swaled' area that discharges to the wetlands associated with Muddy Brook. This setup generally mimics existing drainage patterns – the existing drain network discharges directly to a vegetated conveyance ditch with rip-rap at the upstream end where runoff currently discharges. BMP Area 2 takes advantage of the existing conditions and upgrades this pattern with sediment forebays and checkdams to slow the velocity of runoff coming through, and allow for additional TSS removal and encouraged recharge.

Given space constraints, and with a large upstream contributing area, neither of the graded basins has adequate size and storage to qualify as infiltration basins or sediment forebays on their own. They are considered as integral to the grass channel, a BMP providing TSS removal up to 50%, as sediment forebays up and downstream.

Grassed channels are not considered by the MassDEP manual to provide recharge. It is anticipated – given the up and downstream forebays, as well as the vegetated nature of the grass channel throughout the limits of the BMP, recharge will be encouraged by this BMP measure. No credit for recharge is included in the overall calculations.

4 Regulatory Compliance

4.1 Clean Water Act

Section 401 of the federal Clean Water Act (CWA) (33 USC 1251-1376), and the regulations that implement the Act, require the enhancement and protection of surface waters from pollution to ensure they are able to support their designated uses. The project is filing a Notice of Intent (NOI) with the Town of Mendon Conservation Commission to describe the project and its impact to sensitive resources protected by the Clean Water Act and the ten Massachusetts Stormwater Standards.

4.2 National Pollutant Discharge Elimination System

The U.S. Environmental Protection Agency (EPA) in partnership with MassDEP administers the National Pollutant Discharge Elimination System (NPDES) permit program, which regulates point source discharges to waters of the United States to control water pollution. The Town of Mendon is authorized to discharge stormwater in accordance with the NPDES Municipal Separate Storm Sewer System (MS4) General Permit. The MS4 General Permit includes numerous requirements to improve stormwater management through public education, upgraded infrastructure, and municipal bylaws. The permit also requires cities to locate and correct any unauthorized sewage discharges into the stormwater system.

Construction for this project site will require a NPDES Construction General Permit, which regulates erosion control, pollution prevention, and stormwater management (including construction dewatering) at construction sites larger than one acre. A Stormwater Pollution Prevention Plan (SWPPP) is required by the NPDES Construction General Permit and must identify potential pollutant source areas and describe measures to be employed for erosion and sedimentation control, temporary stormwater management, dust control, and winter stabilization. The design includes a specification for the contractor to follow when preparing and implementing a SWPPP.

4.3 Massachusetts DEP Stormwater Management Standards

The Massachusetts Stormwater Management Standards are applicable under the Massachusetts Wetlands Protection Act (WPA) regulations (310 CMR 10.00) in 2008. This project will be subject to the WPA because there are jurisdictional wetland resource areas within the project's limit of work. Under the Massachusetts Stormwater Management Standards, this project qualifies as a redevelopment project.

Below is a summary of how the project will comply with the Massachusetts Stormwater

Management Standards.

- Standard 1: No New Untreated Discharges or Erosion to Wetlands

The proposed design fully meets the requirements of Standard 1, which states that no new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. With deep sump catch basins proposed for all proposed inlets, no new untreated discharges are proposed by the project. The BMPs included in the proposed stormwater management system are designed in accordance with the Massachusetts DEP Stormwater Handbook.

- Standard 2: Peak Rate Attenuation

The project meets Standard 2 only to the maximum extent practicable. This Standard states that stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. The proposed BMP measures will reduce peak flows during small storm events but will provide only negligible reduction of peak flows during larger storm events. The right-of-way constraints limit the ability to provide any additional detention to fully meet the requirements of the standard. Pipe sizing calculations are included in Appendix D to demonstrate that the design provides a closed drainage network with capacity to convey the stormwater runoff from the project. The wetland buffer between the project site and the nearest flowing water body is sufficient to dissipate any potential flow increases leaving the project site.

- Standard 3: Stormwater Recharge

The proposed design fully meets the requirements of Standard 3 which states that loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater BMPs, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

For discharge to the outfall to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to at least 25% is provided via a deep sump catch basins. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for BMP management and recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent

practicable for Standards 3 and 6.

The project adds approximately 1.45 acres of impervious surface area. While only a portion of the project is within HSG B soils, the Required Recharge Volume is conservatively assumed to apply for HSG B soils at all infiltration measures within project limits, resulting in a Required Recharge Volume of 1,846 cubic feet. The surface infiltration basin includes a forebay for pretreatment that is sized for 0.1 inch of rainfall over the impervious area that drains to the basin. Static method calculations are included in Appendix E to demonstrate that the surface infiltration basin at BMP 1 and downstream sediment forebay at BMP 1 recharge 2,163 cubic feet of runoff, exceeding the Required Recharge Volume for the project's increase in impervious area. The appendix also includes Drawdown Calculations to demonstrate that the basins will drain in less than the maximum 72 hours allowed.

- Standard 4: Water Quality

The project meets Standard 4 only to the maximum extent practicable. Standard 4 states that stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:

- Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

- Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and

- Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook

The Infiltration and BMP Basin Sizing Calculations are included in Appendix E. Deep sump catch basins, or a gutter inlet connecting to a manhole with a sump, are provided at all locations where a new catch basin is proposed. The portion of the project that drains to the BMPs includes 2.60 acres of impervious area, almost double the 1.45 acres of impervious area added by the project. All BMP areas are designed to provide at least 63% TSS removal, discharging less than the remainder of the project which uses only deep sump catch basins to remove 25% TSS. Therefore, the weighted average TSS removal is less than 80%.

However, this project improves upon existing conditions by providing more water quality treatment than the current drainage system provides, by providing 69% TSS removal for an impervious area larger than the impervious area added by the project. The majority of the treatment trains for BMP areas provide TSS removal in excess of 80%, and a table showing the TSS removal for each BMP treatment train is included in the table below. A Long Term

Pollution Prevention Plan is not included because the design requires no post-construction actions beyond MassDOT's standard operating procedures.

Catchment	Impervious Area (SF)	WQ Treatment (%)
BMP 2 Road	91,854	63%
BMP 1 Road	21,264	94%
BMP 1 Basin 1 Direct Flow	655	93%
BMP 1 Basin 2 Direct Flow	1,225	63%
	Weighted Average:	69%

It is further noted that the downstream basin of BMP 2 (the BMP with the largest contributing drainage area), after conveying through the designed grass channel, ultimately discharges to an existing grassed conveyance ditch that will remain in place beyond the grading limits of BMP 2. While no credit is claimed in the calculation for treatment by the existing swale, conveyance in natural grass channels has additional potential stormwater quality and recharge benefits.

For discharge to the outfall to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to at least 25% is provided via a deep sump catch basins. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for BMP management and recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standards 4 and 6.

All measures designed for infiltration are designed for the 1-inch water quality volume, and all conveyance measures with TSS removal credit are designed for the water quality flow resulting from a 1-inch, 24-hour storm. Calculations demonstrating compliance with the standards in the MassDEP BMP manual for all measures removing suspended solids from runoff are included in Appendix E.

- Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The proposed design fully meets the requirements of Standard 5, which states that for land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. None of the land uses within the project limits have higher potential pollutant loads.

- Standard 6: Critical Areas

As a Redevelopment Project, the project meets the 44% TSS removal pretreatment requirements of Standard 6 only to the maximum extent practicable, but fully meets the 1-inch water quality volume requirement for all designed infiltration areas. The grassed channel in BMPs 1 and 2 are designed for the appropriate water quality flow draining to each, as well as the other standards outlined in the MassDEP BMP Manual. Standard 6 states that stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas. Portions of the project discharge to a Coldwater Fishery Resource as designated by the Massachusetts Division of Fisheries and Wildlife (Muddy Brook). Given constraints in grading, available right-of-way, and the goal of minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for specified BMP measures, including pretreatment, infiltration, and TSS removal could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standard 6.

- Standard 7: Redevelopment Projects

Standard 7 states that a redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges would comply with Standard 1 only to the maximum extent practicable. The proposed redevelopment project would also comply with Standards 2, 3, 4 and 6 to the maximum extent practicable, as noted with project restraints. All other requirements of the Stormwater Management Standards will be met by the proposed work and improve existing conditions.

- Standard 8: Construction Period Pollution Prevention, Erosion/Sed. Controls

This project sites fully complies with Standard 8, which states that a plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

The project site will obtain coverage under the Massachusetts NPDES Construction General Permit. As required under this permit, a SWPPP would be developed and submitted before land disturbance begins. The SWPPP will be developed by the contractor according the MassDOT's specifications and will include the following:

o Construction period pollution prevention measures;

o Erosion and sedimentation control plan drawings;

o Detailed drawings and specifications for erosion control BMPs, and sizing calculations;

o An operation and maintenance plan for erosion and sedimentation controls;

o An inspection schedule; and

o A maintenance schedule

- Standard 9: Operation and Maintenance Plan

The proposed design fully meets the requirements of Standard 9, which states that a long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed. A project-specific Post Construction Operation and Maintenance Plan is not included because the design requires no post-construction actions beyond MassDOT's standard maintenance activities.

- Standard 10: Prohibition of Illicit Discharges

The project site is designed to fully comply with Standard 10, which states that all illicit discharges to the stormwater management system are prohibited. The proposed project elements would be designed to be in full compliance with current standards. Any property owners identified with illicit connections will be contacted by MassDOT and disconnected from the MassDOT system unless the property owner obtains the required permits for the connection. An Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to post-construction BMPs.

5 Conclusion

The proposed stormwater system will collect stormwater runoff in proposed and existing catch basin structures, and convey flow through proposed and existing pipe, which ultimately discharge to existing outfalls. No new outfall locations for this project are proposed, though some are adjusted in location. The existing drainage system, within project limits, is being utilized to the maximum extent practicable to avoid disturbance to the existing roadway drainage system. The stormwater system will adequately convey the design storm through project limits. Pipe sizing and catch basin spread have been designed and confirmed to be within allowable limits in order to meet the requirements of the Mass Highway Drainage Design Guide Chapter 8, other than where specifically noted. Several BMPs, designed for infiltration and/or conveyance and in accordance with the Mass DEP Stormwater Handbook, are proposed to provide water quality and recharge to stormwater runoff. Additionally, deep sump catch basins are proposed to provide an added level of sediment removal within the drainage networks. These proposed drainage design features provide an improvement over existing drainage conditions.

Appendix A

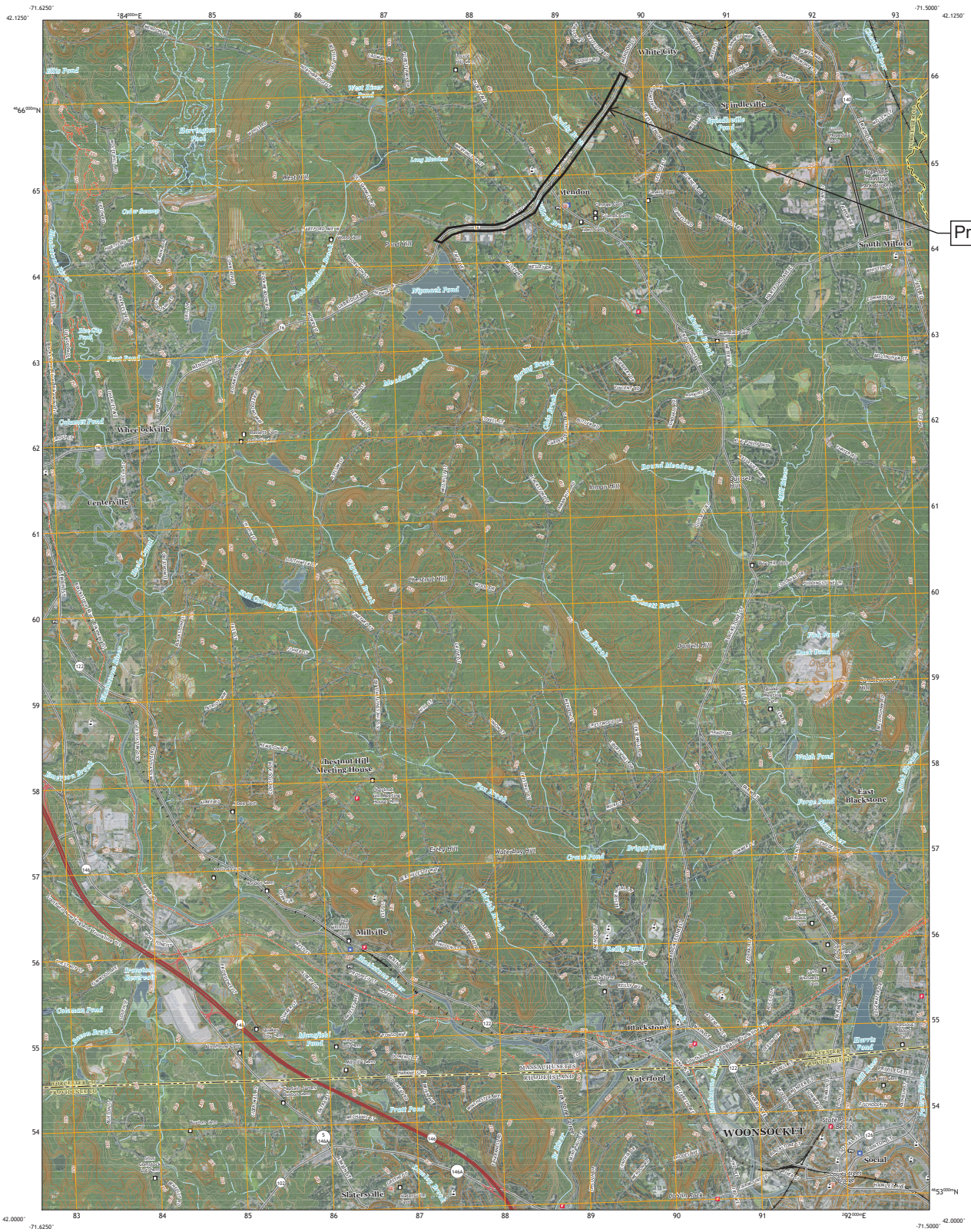
USGS Project Locus Map
NOAA Atlas 14 Rainfall Rainfall Data
FEMA Flood Zone Map
NRCS Web Soil Survey Map

USGS science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

BLACKSTONE QUADRANGLE
MASSACHUSETTS - RHODE ISLAND
7.5-MINUTE SERIES



Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid Universal Transverse Mercator, Zone 19T
This map is not a legal document. Boundaries may be
generalized for this map scale. Private lands within government
reservations may not be shown. Obtain permission before
entering private lands.

Imagery.....NAIP, July 2016 - September 2016
Roads.....U.S. Census Bureau, 2016 - 2018
Names.....GNIS, 1974 - 2018
Hydrography.....National Hydrography Dataset, 2004 - 2015
Contours.....National Elevation Dataset, 2012
Boundaries.....Multiple sources; see metadata file 2016 - 2017

Wetlands.....FWS National Wetlands Inventory 1992 - 2010

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
BG
Grid Zone Designation
19T

SCALE 1:24 000

KILOMETERS 0 0.5 1 2
METERS 1000 500 0 1000 2000
MILES 0 0.5 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard.

MASSACHUSETTS
QUADRANGLE LOCATION

1 Grafton
2 Milford
3 Holliston
4 Uxbridge
5 Franklin
6 Chepachet
7 Georgiaville
8 Pawtucket
ADJOINING QUADRANGLES

ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

BLACKSTONE, MA, RI
2021

NSN 7643013080492
NGA REF NO. USGSX24K249

NOAA Atlas 14, Volume 10, Version 3
Location name: Mendon, Massachusetts, USA*
Latitude: 42.1073°, Longitude: -71.5533°
Elevation: 382.44 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.01** (3.14-5.02)	**4.80** (3.77-6.02)	**6.10** (4.78-7.68)	**7.19** (5.59-9.11)	**8.68** (6.52-11.5)	**9.80** (7.21-13.3)	**11.0** (7.82-15.4)	**12.3** (8.29-17.7)	**14.1** (9.16-21.2)	**15.6** (9.86-23.9)
10-min	**2.84** (2.23-3.55)	**3.40** (2.67-4.27)	**4.33** (3.38-5.45)	**5.09** (3.96-6.45)	**6.15** (4.62-8.15)	**6.95** (5.11-9.41)	**7.78** (5.54-10.9)	**8.69** (5.87-12.6)	**9.99** (6.49-15.0)	**11.0** (6.99-16.9)
15-min	**2.22** (1.75-2.79)	**2.67** (2.09-3.35)	**3.39** (2.65-4.27)	**3.99** (3.10-5.06)	**4.82** (3.62-6.39)	**5.44** (4.00-7.38)	**6.10** (4.34-8.58)	**6.82** (4.60-9.85)	**7.84** (5.08-11.7)	**8.66** (5.48-13.3)
30-min	**1.52** (1.20-1.91)	**1.83** (1.43-2.29)	**2.33** (1.82-2.93)	**2.74** (2.13-3.48)	**3.32** (2.49-4.39)	**3.75** (2.76-5.08)	**4.20** (2.99-5.90)	**4.69** (3.17-6.78)	**5.39** (3.50-8.09)	**5.96** (3.77-9.13)
60-min	**0.965** (0.758-1.21)	**1.16** (0.911-1.46)	**1.48** (1.16-1.86)	**1.75** (1.36-2.21)	**2.11** (1.59-2.80)	**2.39** (1.75-3.23)	**2.67** (1.90-3.76)	**2.99** (2.02-4.32)	**3.44** (2.23-5.15)	**3.80** (2.40-5.81)
2-hr	**0.617** (0.488-0.768)	**0.746** (0.590-0.930)	**0.957** (0.754-1.20)	**1.13** (0.886-1.42)	**1.37** (1.04-1.81)	**1.55** (1.15-2.10)	**1.74** (1.25-2.45)	**1.96** (1.33-2.81)	**2.27** (1.48-3.38)	**2.53** (1.60-3.84)
3-hr	**0.474** (0.377-0.588)	**0.574** (0.456-0.713)	**0.739** (0.583-0.920)	**0.874** (0.687-1.10)	**1.06** (0.807-1.40)	**1.20** (0.894-1.62)	**1.35** (0.975-1.89)	**1.52** (1.03-2.18)	**1.77** (1.16-2.63)	**1.98** (1.26-3.00)
6-hr	**0.304** (0.243-0.375)	**0.369** (0.294-0.455)	**0.475** (0.377-0.588)	**0.562** (0.445-0.701)	**0.683** (0.523-0.894)	**0.773** (0.579-1.04)	**0.870** (0.633-1.22)	**0.985** (0.671-1.40)	**1.16** (0.758-1.71)	**1.31** (0.833-1.96)
12-hr	**0.191** (0.154-0.234)	**0.232** (0.186-0.284)	**0.298** (0.239-0.367)	**0.354** (0.281-0.438)	**0.430** (0.331-0.560)	**0.486** (0.367-0.649)	**0.547** (0.402-0.764)	**0.622** (0.425-0.877)	**0.736** (0.483-1.08)	**0.834** (0.534-1.24)
24-hr	**0.115** (0.093-0.140)	**0.140** (0.114-0.171)	**0.182** (0.147-0.223)	**0.217** (0.174-0.267)	**0.265** (0.206-0.344)	**0.300** (0.228-0.399)	**0.339** (0.251-0.472)	**0.387** (0.265-0.542)	**0.461** (0.303-0.669)	**0.525** (0.337-0.777)
2-day	**0.065** (0.053-0.079)	**0.081** (0.066-0.098)	**0.106** (0.086-0.129)	**0.128** (0.103-0.156)	**0.157** (0.122-0.202)	**0.178** (0.136-0.236)	**0.202** (0.150-0.279)	**0.231** (0.159-0.322)	**0.277** (0.183-0.400)	**0.317** (0.204-0.467)
3-day	**0.047** (0.039-0.057)	**0.059** (0.048-0.071)	**0.077** (0.063-0.093)	**0.092** (0.075-0.112)	**0.113** (0.089-0.145)	**0.129** (0.099-0.169)	**0.146** (0.109-0.201)	**0.167** (0.115-0.231)	**0.200** (0.132-0.287)	**0.229** (0.148-0.335)
4-day	**0.038** (0.031-0.046)	**0.047** (0.039-0.056)	**0.061** (0.050-0.074)	**0.073** (0.059-0.089)	**0.090** (0.070-0.115)	**0.102** (0.078-0.133)	**0.115** (0.086-0.158)	**0.131** (0.091-0.181)	**0.157** (0.104-0.225)	**0.180** (0.116-0.262)
7-day	**0.026** (0.022-0.031)	**0.032** (0.026-0.038)	**0.040** (0.033-0.048)	**0.048** (0.039-0.057)	**0.058** (0.045-0.073)	**0.065** (0.050-0.084)	**0.073** (0.054-0.099)	**0.083** (0.057-0.113)	**0.097** (0.065-0.138)	**0.110** (0.071-0.159)
10-day	**0.021** (0.018-0.025)	**0.025** (0.021-0.030)	**0.031** (0.026-0.038)	**0.037** (0.030-0.044)	**0.044** (0.035-0.055)	**0.049** (0.038-0.064)	**0.055** (0.041-0.074)	**0.062** (0.043-0.084)	**0.072** (0.048-0.102)	**0.080** (0.052-0.116)
20-day	**0.015** (0.012-0.018)	**0.017** (0.014-0.020)	**0.020** (0.017-0.024)	**0.023** (0.019-0.028)	**0.027** (0.021-0.033)	**0.030** (0.023-0.038)	**0.033** (0.024-0.043)	**0.036** (0.025-0.049)	**0.040** (0.027-0.057)	**0.044** (0.029-0.063)
30-day	**0.012** (0.010-0.015)	**0.014** (0.012-0.016)	**0.016** (0.013-0.019)	**0.018** (0.015-0.021)	**0.021** (0.016-0.025)	**0.023** (0.017-0.028)	**0.025** (0.018-0.032)	**0.027** (0.019-0.036)	**0.029** (0.020-0.041)	**0.031** (0.020-0.045)
45-day	**0.010** (0.009-0.012)	**0.011** (0.009-0.013)	**0.013** (0.011-0.015)	**0.014** (0.012-0.017)	**0.016** (0.013-0.019)	**0.017** (0.013-0.022)	**0.019** (0.014-0.024)	**0.020** (0.014-0.027)	**0.022** (0.015-0.030)	**0.023** (0.015-0.032)
60-day	**0.009** (0.008-0.010)	**0.010** (0.008-0.011)	**0.011** (0.009-0.013)	**0.012** (0.010-0.014)	**0.013** (0.011-0.016)	**0.014** (0.011-0.018)	**0.015** (0.011-0.020)	**0.016** (0.012-0.022)	**0.017** (0.012-0.024)	**0.018** (0.012-0.026)

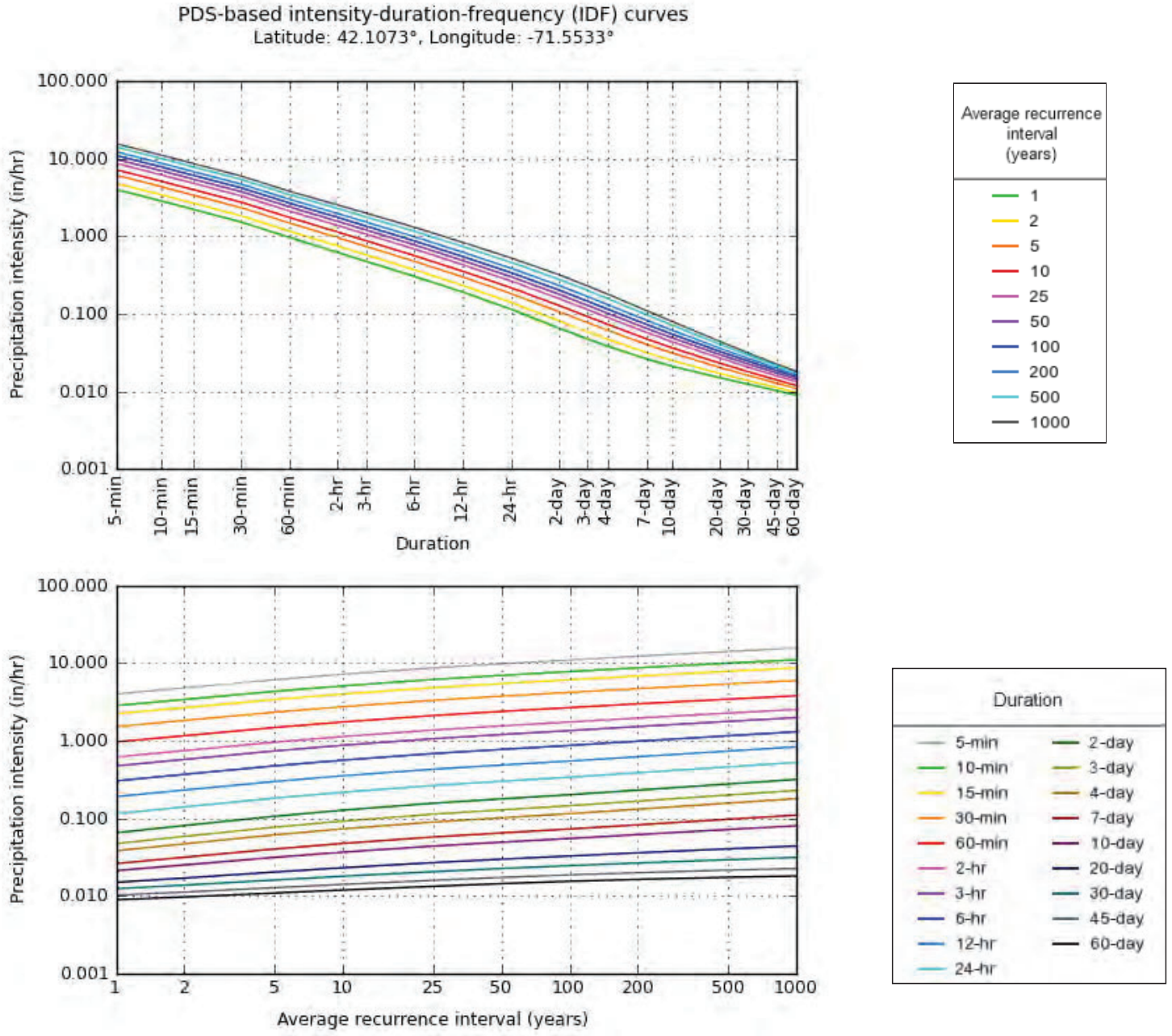
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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PF graphical



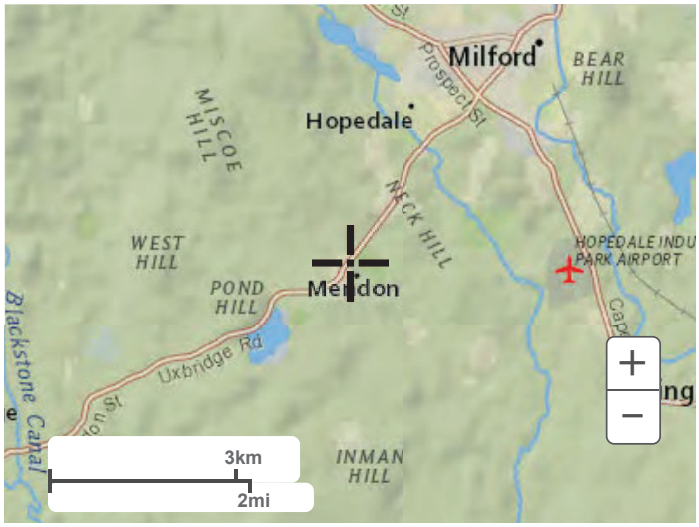
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Created (GMT): Tue May 3 18:29:43 2022

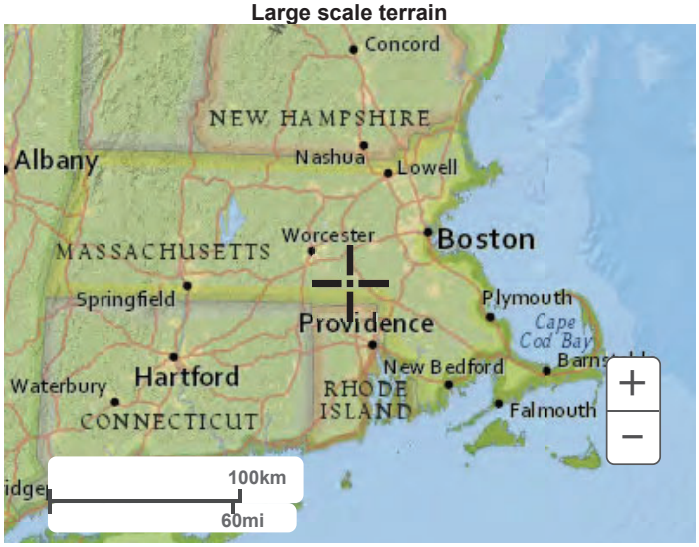
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Maps & aerials

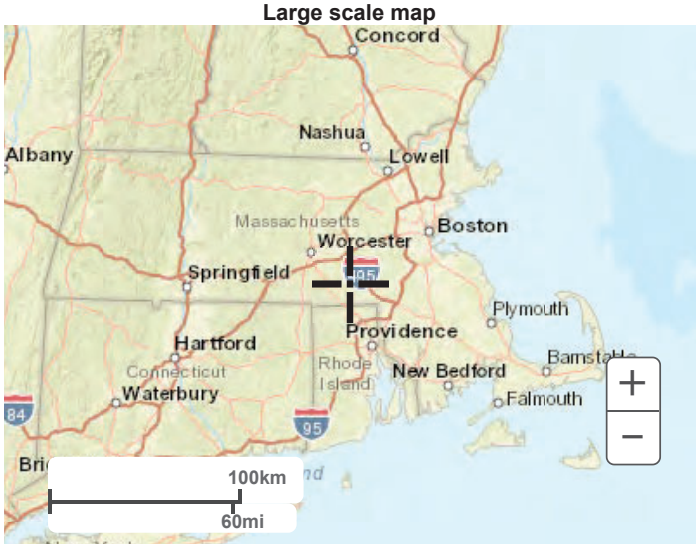
Small scale terrain



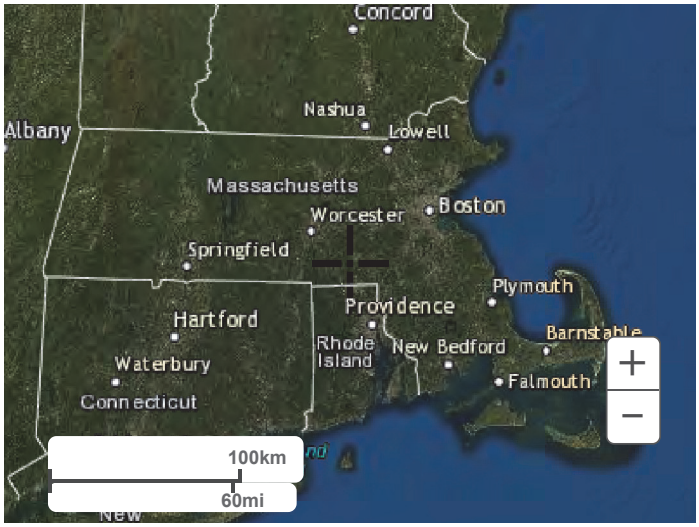
Large scale terrain



Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 10, Version 3
Location name: Mendon, Massachusetts, USA*
Latitude: 42.1073°, Longitude: -71.5533°
Elevation: 382.44 ft**
* source: ESRI Maps
** source: USGS

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NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.334** (0.262-0.418)	**0.400** (0.314-0.502)	**0.508** (0.398-0.640)	**0.599** (0.466-0.759)	**0.723** (0.543-0.959)	**0.817** (0.601-1.11)	**0.915** (0.652-1.29)	**1.02** (0.691-1.48)	**1.18** (0.763-1.76)	**1.30** (0.822-1.99)
10-min	**0.473** (0.371-0.592)	**0.567** (0.445-0.711)	**0.721** (0.564-0.908)	**0.849** (0.660-1.08)	**1.02** (0.770-1.36)	**1.16** (0.851-1.57)	**1.30** (0.923-1.82)	**1.45** (0.978-2.09)	**1.67** (1.08-2.50)	**1.84** (1.17-2.82)
15-min	**0.556** (0.437-0.697)	**0.667** (0.523-0.837)	**0.848** (0.663-1.07)	**0.998** (0.776-1.26)	**1.21** (0.906-1.60)	**1.36** (1.00-1.85)	**1.52** (1.09-2.15)	**1.70** (1.15-2.46)	**1.96** (1.27-2.94)	**2.17** (1.37-3.32)
30-min	**0.760** (0.598-0.953)	**0.914** (0.717-1.15)	**1.17** (0.911-1.47)	**1.37** (1.07-1.74)	**1.66** (1.25-2.20)	**1.87** (1.38-2.54)	**2.10** (1.50-2.95)	**2.35** (1.58-3.39)	**2.70** (1.75-4.04)	**2.98** (1.89-4.56)
60-min	**0.965** (0.758-1.21)	**1.16** (0.911-1.46)	**1.48** (1.16-1.86)	**1.75** (1.36-2.21)	**2.11** (1.59-2.80)	**2.39** (1.75-3.23)	**2.67** (1.90-3.76)	**2.99** (2.02-4.32)	**3.44** (2.23-5.15)	**3.80** (2.40-5.81)
2-hr	**1.23** (0.976-1.54)	**1.49** (1.18-1.86)	**1.91** (1.51-2.40)	**2.26** (1.77-2.85)	**2.75** (2.08-3.62)	**3.11** (2.30-4.19)	**3.49** (2.50-4.89)	**3.92** (2.66-5.63)	**4.54** (2.96-6.76)	**5.06** (3.21-7.69)
3-hr	**1.42** (1.13-1.77)	**1.73** (1.37-2.14)	**2.22** (1.75-2.76)	**2.63** (2.06-3.29)	**3.19** (2.42-4.19)	**3.61** (2.68-4.86)	**4.06** (2.93-5.68)	**4.57** (3.11-6.54)	**5.33** (3.47-7.90)	**5.96** (3.79-9.02)
6-hr	**1.82** (1.46-2.24)	**2.21** (1.76-2.72)	**2.84** (2.26-3.52)	**3.37** (2.66-4.20)	**4.09** (3.13-5.36)	**4.63** (3.47-6.21)	**5.21** (3.79-7.29)	**5.90** (4.02-8.38)	**6.94** (4.54-10.2)	**7.82** (4.99-11.8)
12-hr	**2.30** (1.85-2.82)	**2.79** (2.24-3.42)	**3.60** (2.88-4.42)	**4.26** (3.39-5.27)	**5.18** (3.99-6.75)	**5.86** (4.42-7.82)	**6.59** (4.84-9.20)	**7.49** (5.12-10.6)	**8.87** (5.82-13.0)	**10.0** (6.43-15.0)
24-hr	**2.75** (2.23-3.35)	**3.37** (2.73-4.10)	**4.38** (3.53-5.35)	**5.21** (4.17-6.41)	**6.36** (4.93-8.24)	**7.21** (5.48-9.59)	**8.14** (6.02-11.3)	**9.28** (6.37-13.0)	**11.1** (7.28-16.1)	**12.6** (8.08-18.7)
2-day	**3.13** (2.55-3.78)	**3.88** (3.16-4.69)	**5.10** (4.14-6.19)	**6.12** (4.93-7.47)	**7.52** (5.87-9.69)	**8.55** (6.54-11.3)	**9.68** (7.21-13.4)	**11.1** (7.64-15.4)	**13.3** (8.79-19.2)	**15.2** (9.81-22.4)
3-day	**3.41** (2.79-4.10)	**4.22** (3.45-5.08)	**5.54** (4.51-6.70)	**6.64** (5.37-8.07)	**8.15** (6.38-10.5)	**9.26** (7.10-12.2)	**10.5** (7.82-14.4)	**12.0** (8.29-16.6)	**14.4** (9.52-20.7)	**16.5** (10.6-24.1)
4-day	**3.67** (3.01-4.40)	**4.51** (3.70-5.42)	**5.89** (4.81-7.10)	**7.03** (5.71-8.53)	**8.61** (6.75-11.0)	**9.76** (7.50-12.8)	**11.0** (8.24-15.1)	**12.6** (8.73-17.4)	**15.1** (9.99-21.6)	**17.2** (11.1-25.1)
7-day	**4.40** (3.63-5.25)	**5.30** (4.37-6.33)	**6.77** (5.55-8.11)	**7.99** (6.51-9.63)	**9.66** (7.61-12.2)	**10.9** (8.40-14.2)	**12.3** (9.15-16.6)	**13.9** (9.64-19.0)	**16.4** (10.9-23.2)	**18.5** (12.0-26.8)
10-day	**5.10** (4.22-6.06)	**6.03** (4.98-7.17)	**7.55** (6.22-9.01)	**8.81** (7.20-10.6)	**10.5** (8.31-13.3)	**11.8** (9.12-15.2)	**13.2** (9.85-17.7)	**14.8** (10.3-20.3)	**17.2** (11.5-24.4)	**19.3** (12.5-27.8)
20-day	**7.20** (6.00-8.49)	**8.17** (6.80-9.66)	**9.77** (8.10-11.6)	**11.1** (9.14-13.2)	**12.9** (10.2-16.0)	**14.3** (11.0-18.1)	**15.7** (11.7-20.7)	**17.3** (12.1-23.4)	**19.4** (13.0-27.3)	**21.1** (13.8-30.3)
30-day	**8.93** (7.48-10.5)	**9.94** (8.31-11.7)	**11.6** (9.64-13.7)	**13.0** (10.7-15.4)	**14.8** (11.8-18.3)	**16.3** (12.6-20.5)	**17.7** (13.1-23.0)	**19.2** (13.5-25.8)	**21.1** (14.2-29.5)	**22.6** (14.7-32.2)
45-day	**11.1** (9.32-13.0)	**12.1** (10.2-14.2)	**13.8** (11.6-16.3)	**15.3** (12.7-18.0)	**17.2** (13.7-21.0)	**18.7** (14.5-23.3)	**20.2** (14.9-25.9)	**21.6** (15.2-28.9)	**23.3** (15.7-32.3)	**24.4** (16.0-34.7)
60-day	**12.9** (10.9-15.1)	**14.0** (11.8-16.3)	**15.7** (13.2-18.4)	**17.2** (14.3-20.3)	**19.2** (15.3-23.4)	**20.8** (16.1-25.8)	**22.3** (16.5-28.4)	**23.6** (16.7-31.4)	**25.1** (17.0-34.7)	**26.1** (17.0-36.9)

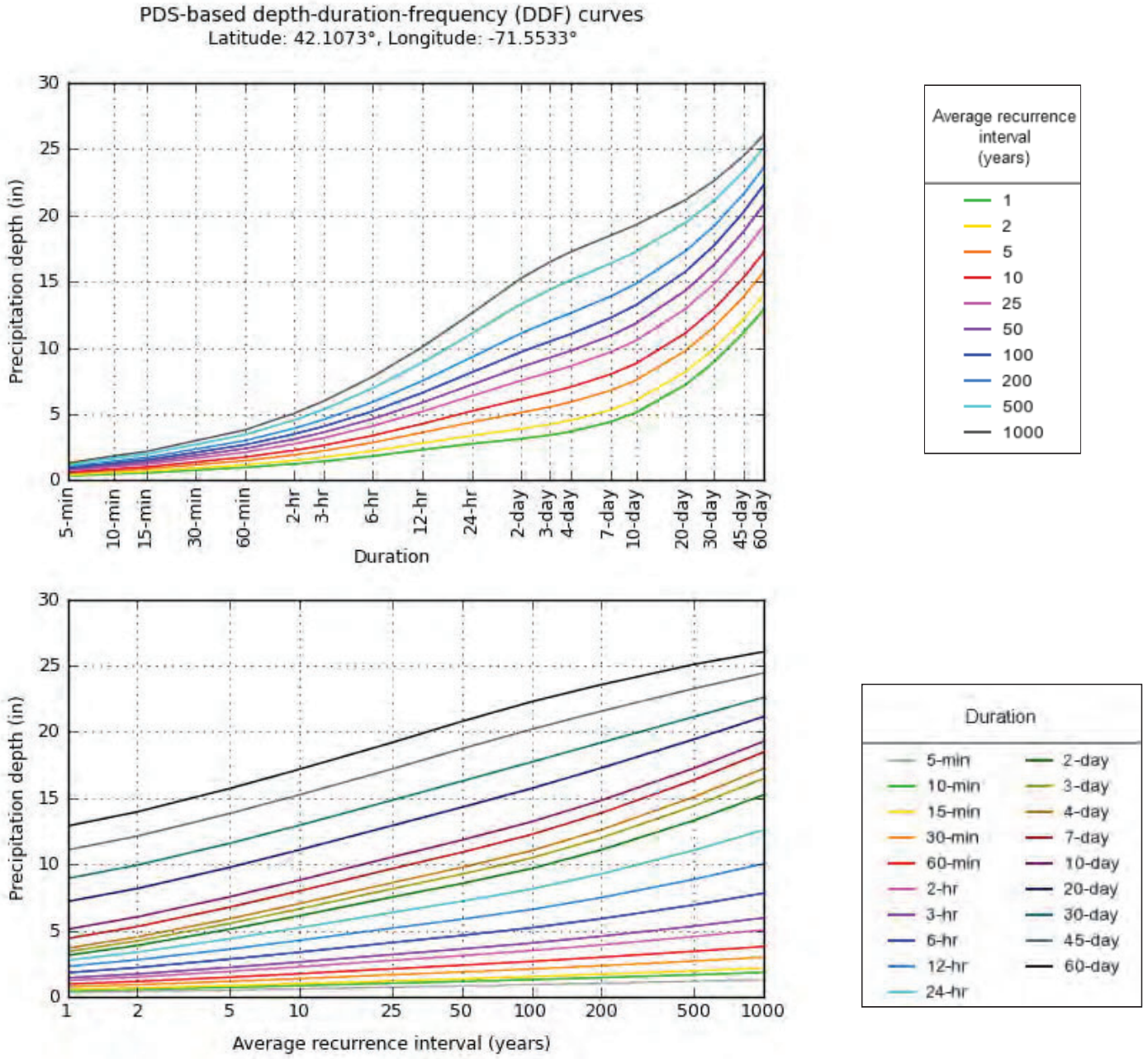
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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PF graphical



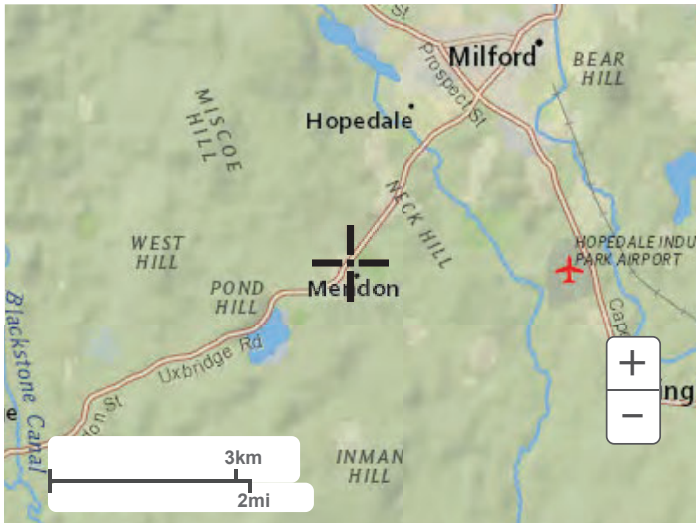
NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Tue May 3 18:27:50 2022

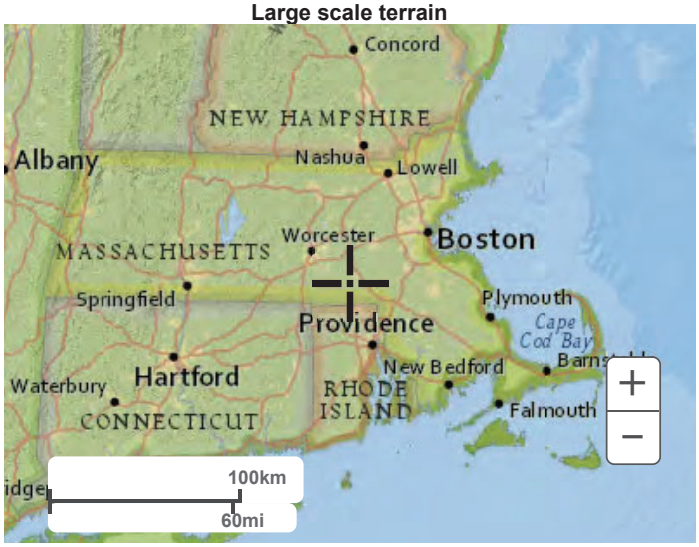
Back to Top

Maps & aerials

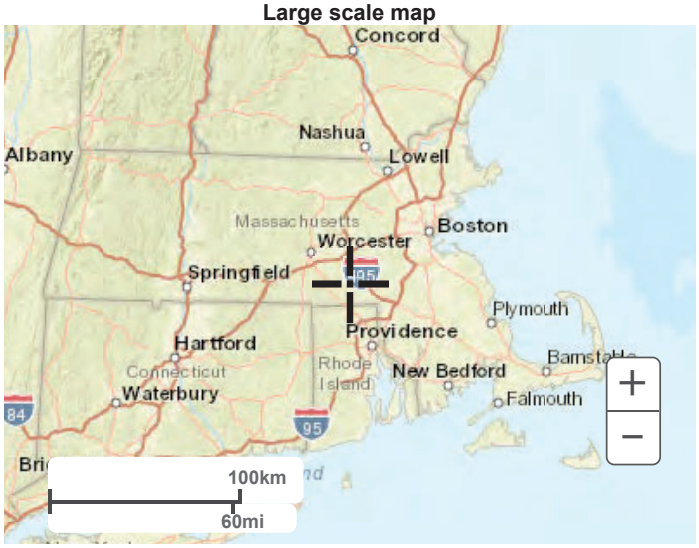
Small scale terrain



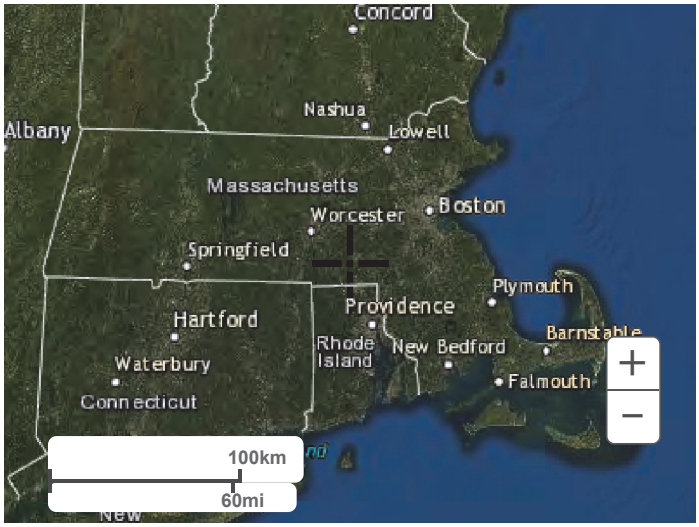
Large scale terrain



Large scale map



Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOTES TO USERS

is fire use in administering the National Flood Insurance Program. It does easily identify all areas subject to flooding, particularly from local drainage of small size. The **community map repository** should be consulted for updated or additional flood hazard information.

more detailed information in areas where **Base Flood Elevations** (BFEs) **odways** have been determined, users are encouraged to consult the Flood nd Floodway Data and/or Summary of Stillwater Elevations tables contained Flood Insurance Study (FIS) Report that accompanies this FIRM. Users e aware that BFEs shown on the FIRM represent rounded whole-foot . These BFEs are intended for flood insurance rating purposes only and d be used as the sole source of flood elevation information. Accordingly, ation data presented in the FIS Report should be utilized in conjunction with for purposes of construction and/or floodplain management.

Base Flood Elevations shown on this map apply only landward of 0.0' erican Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be t coastal flood elevations are also provided in the Summary of Stillwater s table in the Flood Insurance Study Report for this jurisdiction. Elevations the Summary of Stillwater Elevations table should be used for construction odplain management purposes when they are higher than the elevations this FIRM.

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reas not in Special Flood Hazard Areas may be protected by **flood control s**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance port for information on flood control structures for this jurisdiction.

ection used in the preparation of this map was Massachusetts State Plane Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 . Differences in datum, spheroid, projection or UTM zones used in the n of FIRMs for adjacent jurisdictions may result in slight positional s in map features across jurisdiction boundaries. These differences do not accuracy of this FIRM.

vations on this map are referenced to the North American Vertical Datum of ese flood elevations must be compared to structure and ground elevations d to the same **vertical datum**. For information regarding conversion the National Geodetic Vertical Datum of 1929 and the North American Datum of 1988, visit the National Geodetic Survey website at ngs.noaa.gov or contact the National Geodetic Survey at the following

rmation Services
NGS12
Geodetic Survey
#9202
th-West Highway
ing, Maryland 20910-3282
-3242

current elevation, description, and/or location information for **bench marks** this map, please contact the Information Services Branch of the National Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

p information shown on this FIRM was derived from digital orthophotography. files were provided in digital format by Massachusetts Geographic n Systems (MassGIS). Ortho imagery was produced at a scale of 1:5,000. tography is dated April 2005.

e baselines depicted on this map represent the hydraulic modeling baselines n the flood profiles in the FIS report. As a result of improved topographic data, e baseline, in some cases, may deviate significantly from the channel or shown outside the SFHA.

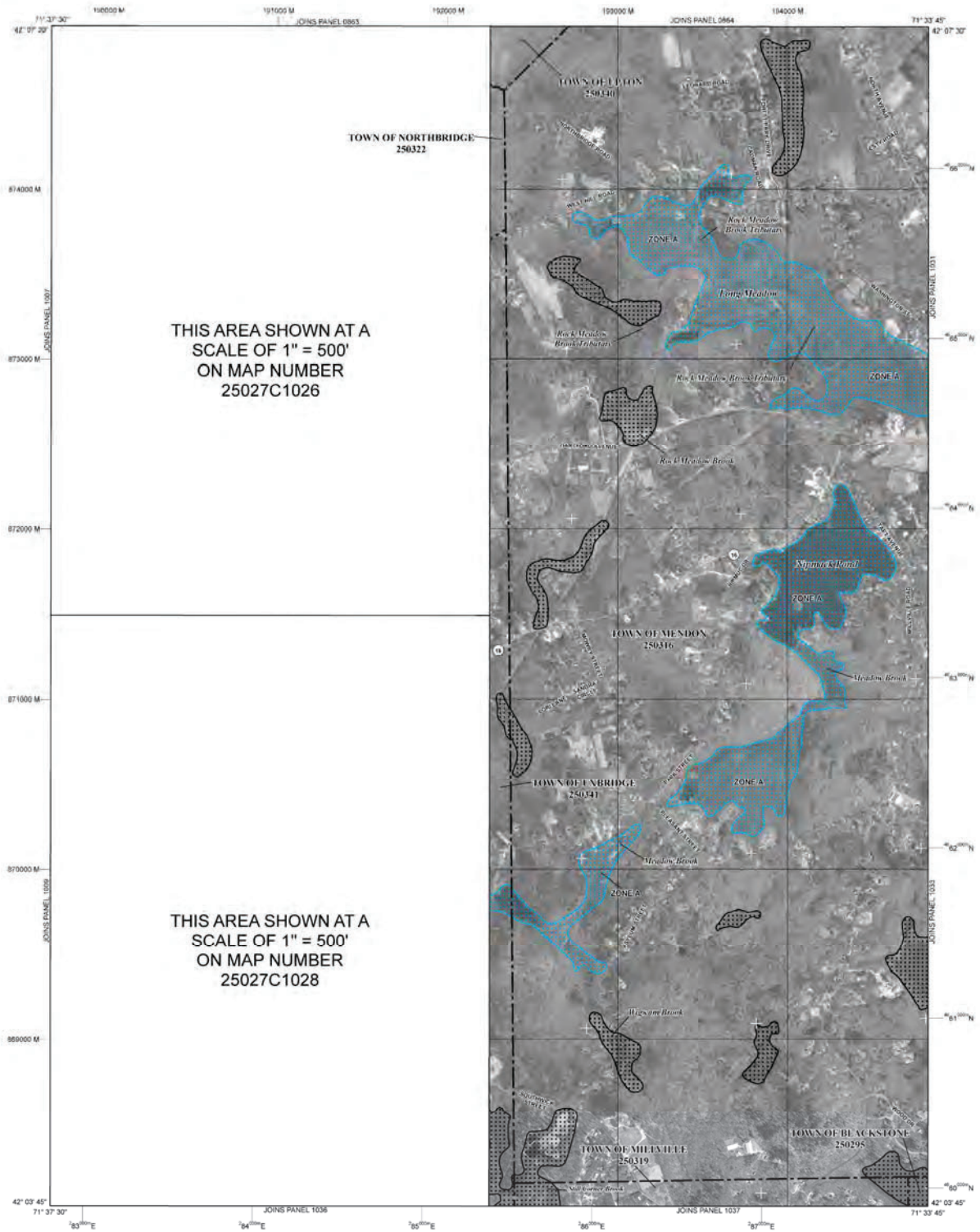
e limits shown on this map are based on the best data available at the time tion, because changes due to annexations or de-annexations may have after this map was published, map users should contact appropriate y officials to verify current corporate limit locations.

fer to the separately printed **Map Index** for an overview map of the own the layout of map panels; community map repository addresses; sting of Communities table containing National Flood Insurance Program each community as well as a listing of the panels on which each community

rmation on available products associated with this FIRM visit the **Map Center (MSC)** website at http://msc.fema.gov. Available products may reviously issued Letters of Map Change, a Flood Insurance Study Report, igital versions of this map. Many of these products can be ordered or directly from the MSC website.

ve **questions about this map**, how to order products, or the National surance Program in general, please call the **FEMA Map Information e (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA http://www.fema.gov/business/nfip.

Proposal No. 608491-1314681



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the Base Flood, is the flood a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, A1-A30, AH, AR, AR/A, AO, V, and VE. The Base Flood Elevation is the water-s elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood El determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); av depths determined. For areas of alluvial fan flooding, velocities also d

ZONE AR — Special Flood Hazard Areas formerly protected from the 1% annual ch flood by a flood control system that was subsequently decertified. Zo AR indicates that the former flood control system is being restored to protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations deter

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood El determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be encroachment so that the 1% annual chance flood can be carried without substantial inc flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood w average depths of less than 1 foot or with drainage areas less than 1 squ mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Are

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and bo dividing Special Flood Hazard Areas of different Base Flood flood depths, or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within feet*

*Referenced to the North American Vertical Datum of 1988

A — A — Cross section line

23 — 23 — Transect line

Culvert

Bridge

45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North (1983 (NAD 83) Western Hemisphere

4668000 M — 1000-meter UTM, Massachusetts State Plane (FIPS Zone 2001), Lambert Conformal Conic pro

1000-meter Universal Transverse Mercator grid

DX5510 — Bench mark (see explanation in Notes to Users

River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
JULY 4, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1030E

FIRM

FLOOD INSURANCE RATE M

WORCESTER COUNT

MASSACHUSETTS

(ALL JURISDICTIONS)

PANEL 1030 OF 1075

(SEE MAP INDEX FOR FIRM PANEL LA

CONTAINS:

COMMUNITY	NUMBER	PANEL
BLACKSTONE, TOWN OF	250295	1030
MENDON, TOWN OF	250316	1030
MILLVILLE, TOWN OF	250319	1030
NORTHBRIDGE, TOWN OF	250322	1030
UPTON, TOWN OF	250340	1030
UXBRIDGE, TOWN OF	250341	1030

Notice to User: The **Map Number** sho should be used when placing map or **Community Number** shown above s used on insurance applications for th community.

MAP NU
25027C
EFFECTIVE
JULY 4

Federal Emergency Management

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography. Base map files were provided in digital format by Massachusetts Geographic Information Systems (MassGIS). Ortho imagery was produced at a scale of 1:5,000. Aerial photography is dated April 2005.

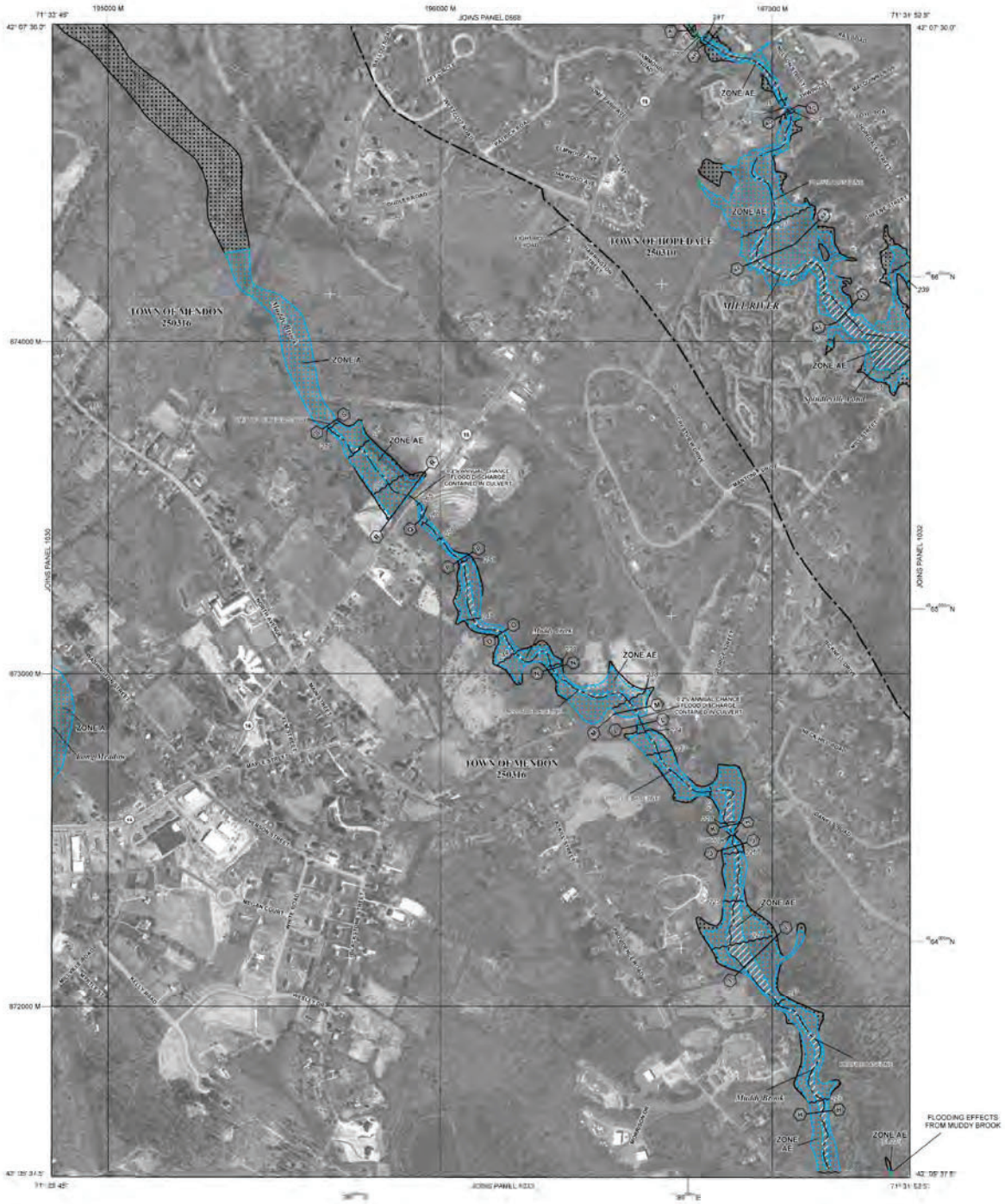
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

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LEGEND

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- **ZONE AE** — Base Flood Elevations determined.
- **ZONE AH** — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- **ZONE AO** — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE AR** — Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- **ZONE A99** — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
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- **ZONE VE** — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- **ZONE X** — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- **ZONE X** — Areas determined to be outside the 0.2% annual chance floodplain.
- **ZONE D** — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- CBRS and OPA Boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 (EL 987) — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- Culvert
- Bridge
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 4989000 M — 1000-meter Universal Transverse Mercator grid values, zone 19N
- 5000000 FT — 1000-meter Universal Transverse Mercator grid values, zone 19N
- CR3510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
July 4, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP — NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1031E

FIRM

FLOOD INSURANCE RATE MAP

WORCESTER COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 1031 OF 1075
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOPEDALE, TOWN OF	250310	1031	E
MENDON, TOWN OF	250316	1031	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

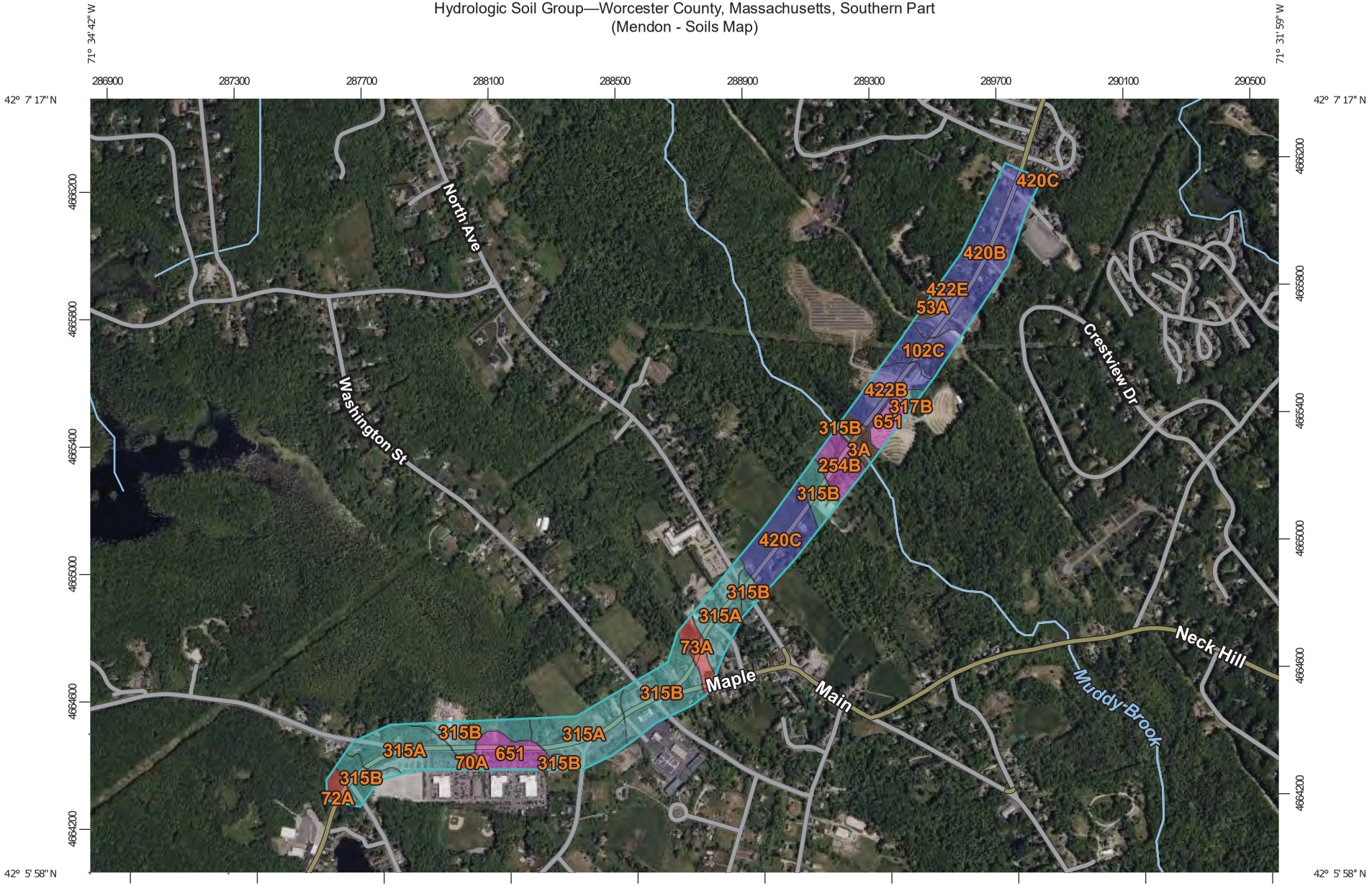
MAP NUMBER
25027C1031E
EFFECTIVE DATE
JULY 4, 2011

Federal Emergency Management Agency

A00830 - 191

Proposal No. 608491-131468

Hydrologic Soil Group—Worcester County, Massachusetts, Southern Part
(Mendon - Soils Map)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 15, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

A00830 - 193

Proposal No. 608491-131468

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3A	Scarboro and Walpole soils, 0 to 3 percent slopes	B/D	2.5	2.2%
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	1.1	1.0%
70A	Ridgebury fine sandy loam, 0 to 3 percent slopes	D	0.9	0.7%
72A	Whitman fine sandy loam, 0 to 3 percent slopes	D	1.5	1.3%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	2.8	2.4%
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	B	5.1	4.4%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	4.8	4.1%
315A	Scituate fine sandy loam, 0 to 3 percent slopes	C	27.8	24.0%
315B	Scituate fine sandy loam, 3 to 8 percent slopes	C	25.4	22.0%
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	C	0.7	0.6%
420B	Canton fine sandy loam, 3 to 8 percent slopes	B	18.3	15.8%
420C	Canton fine sandy loam, 8 to 15 percent slopes	B	10.1	8.7%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	6.0	5.2%
422E	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	B	0.8	0.7%
651	Udorthents, smoothed	A	8.0	6.9%
Totals for Area of Interest			**115.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

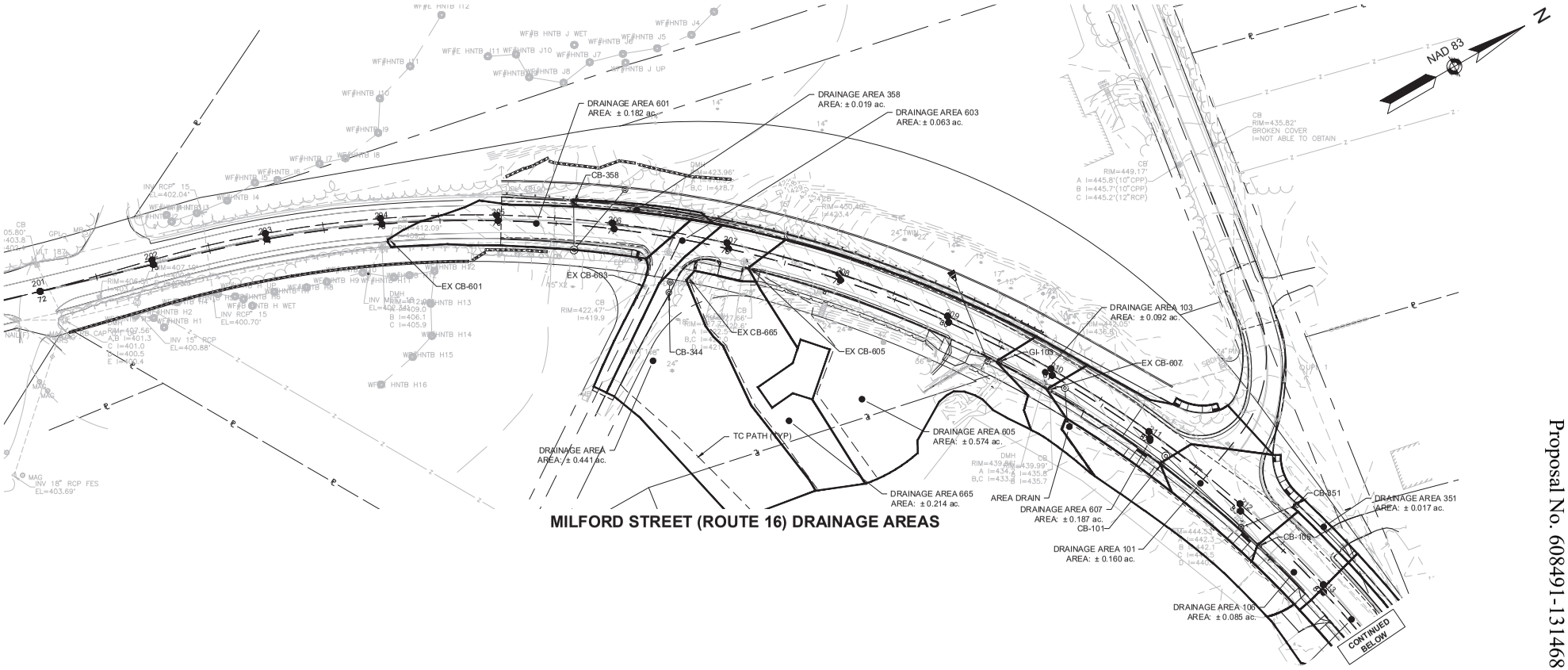
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

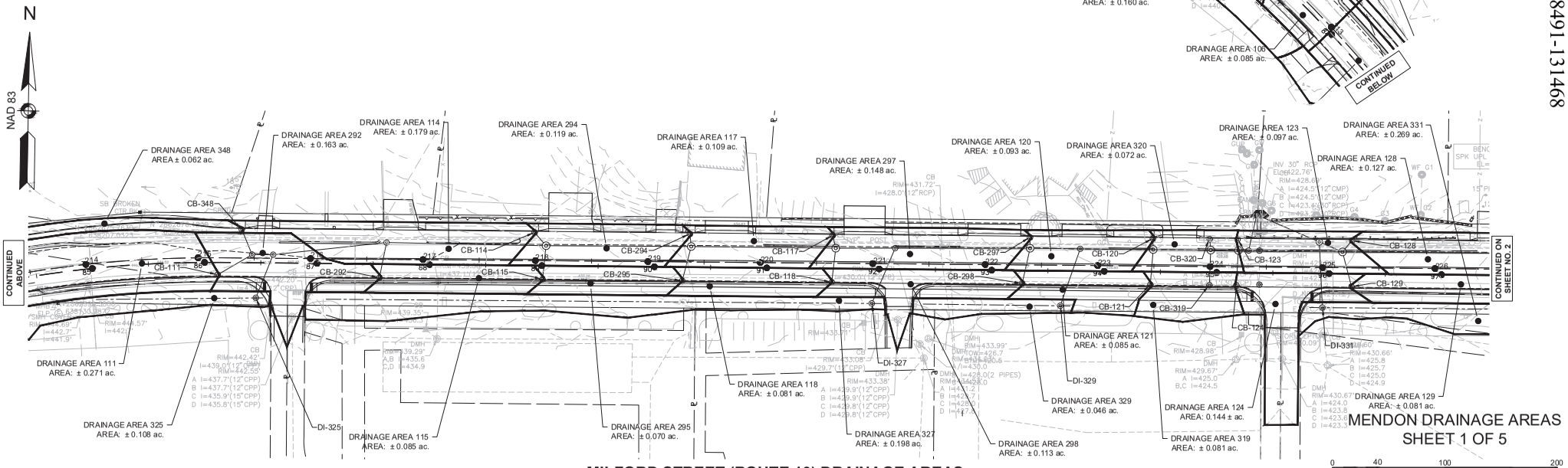
Tie-break Rule: Higher

Appendix B

Catchment Area Plans
Catchment Area Calculations



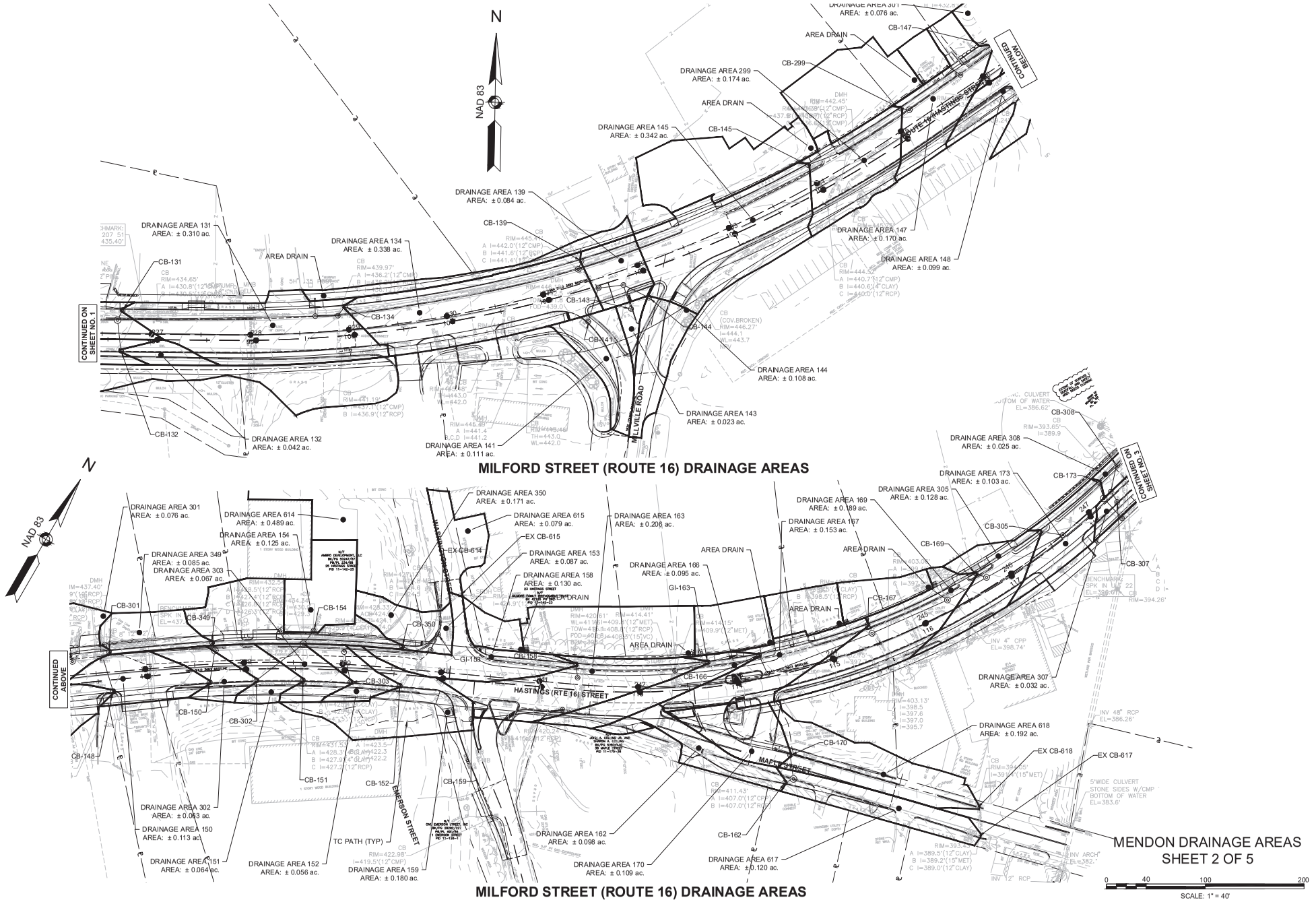
MILFORD STREET (ROUTE 16) DRAINAGE AREAS

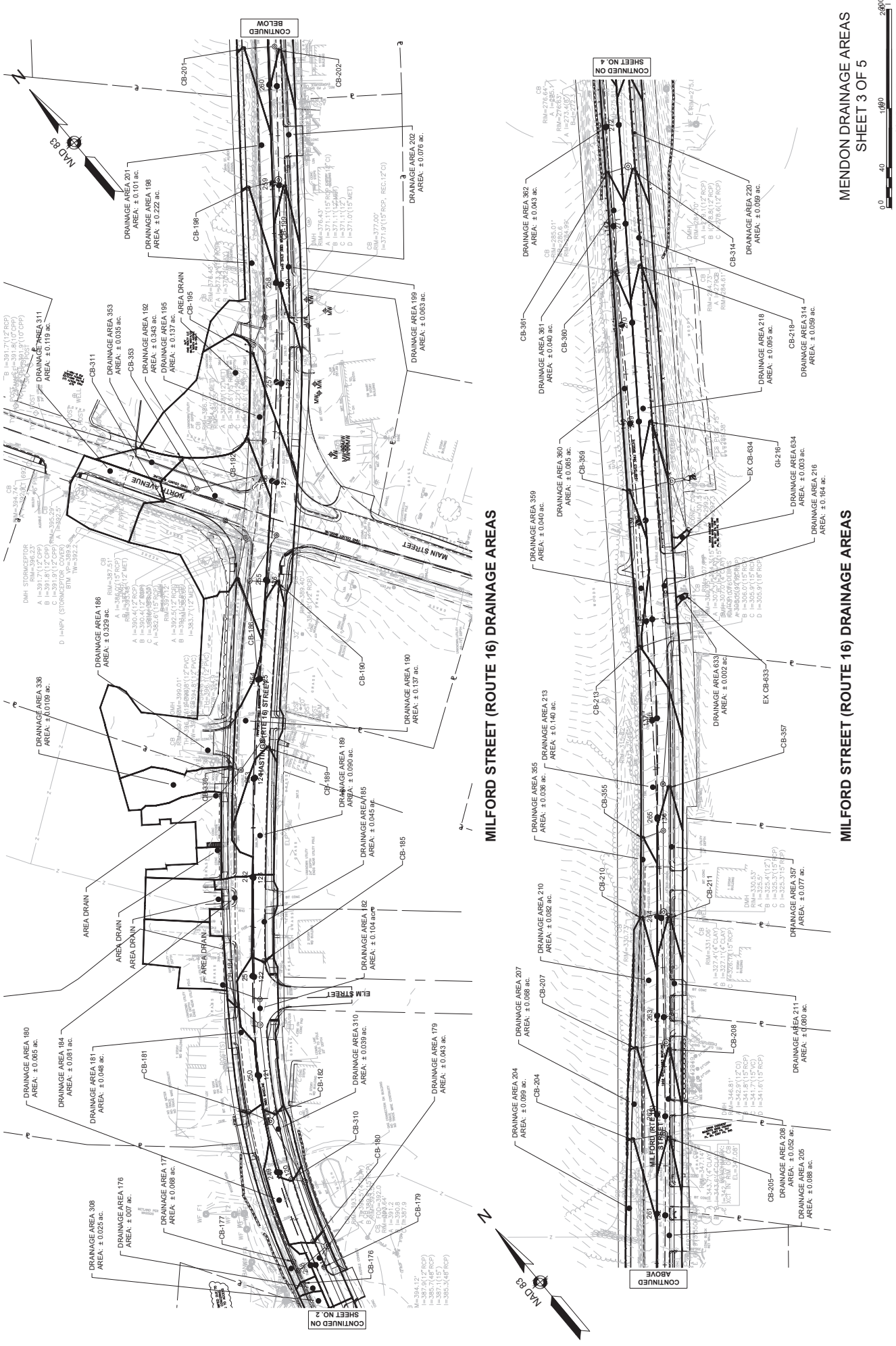


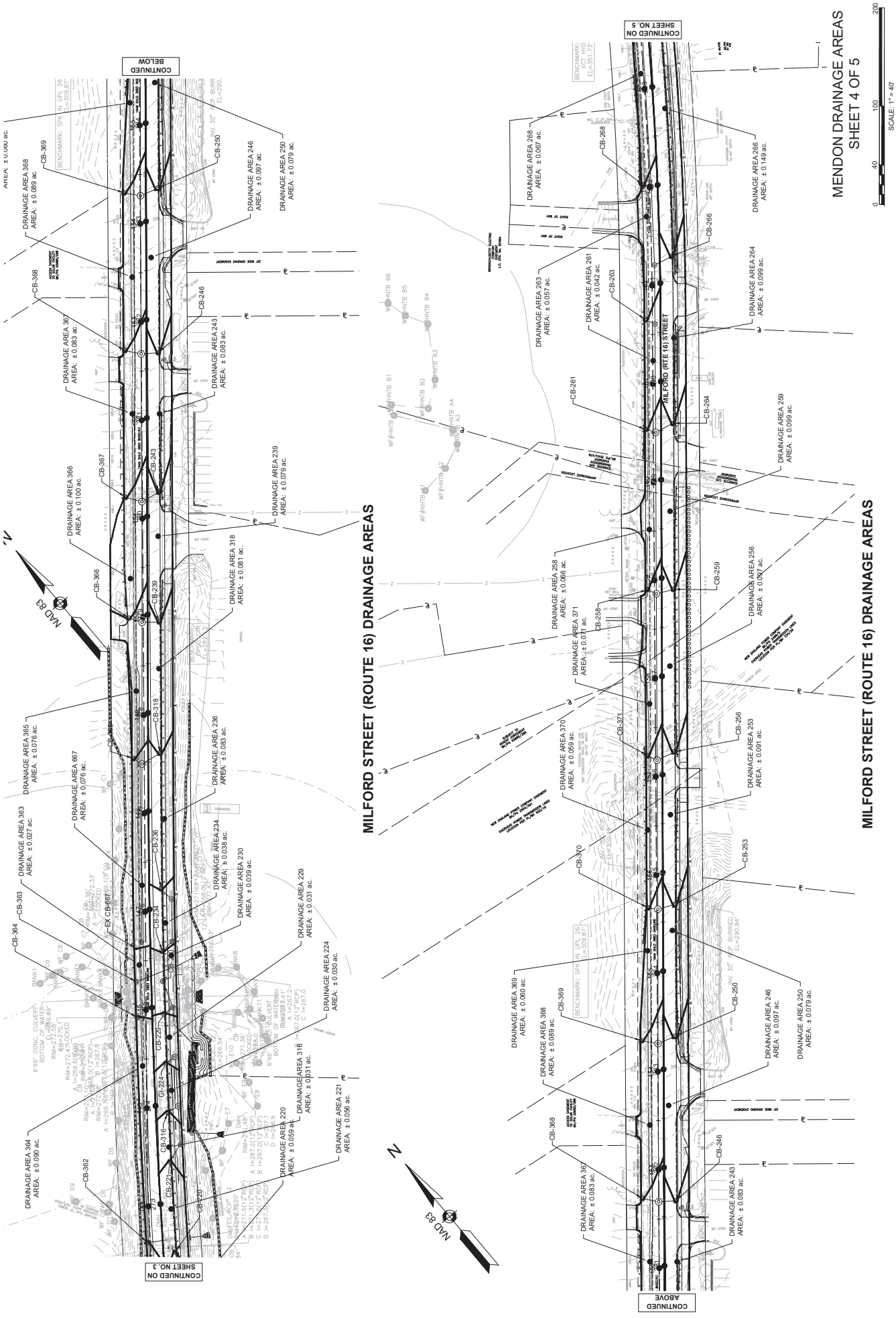
MILFORD STREET (ROUTE 16) DRAINAGE AREAS

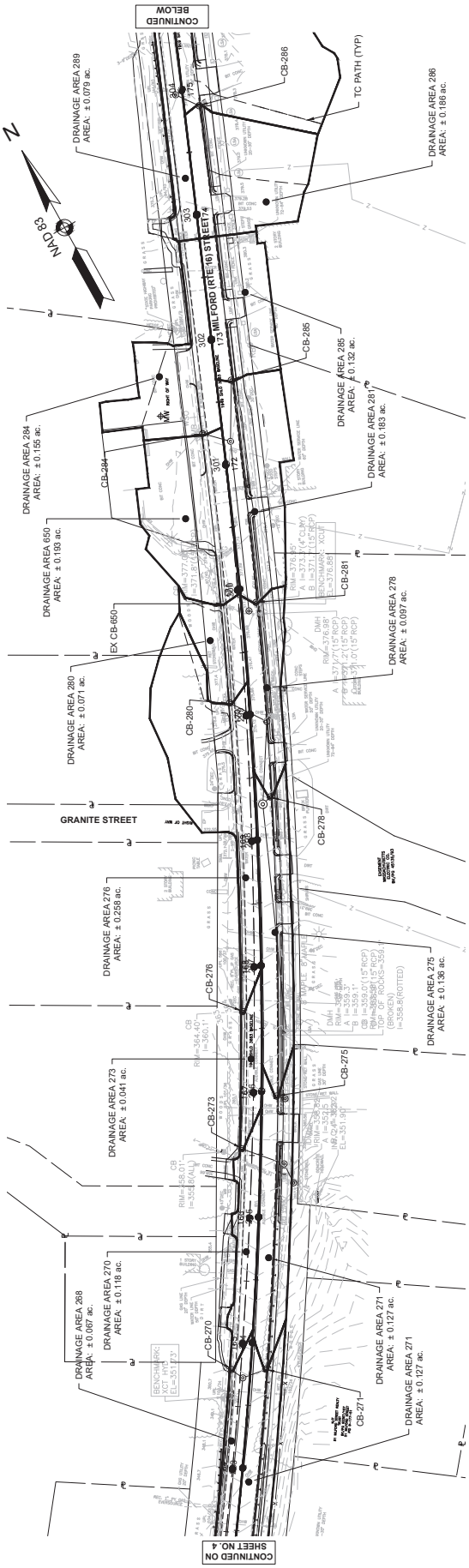
MENDON DRAINAGE AREAS
SHEET 1 OF 5

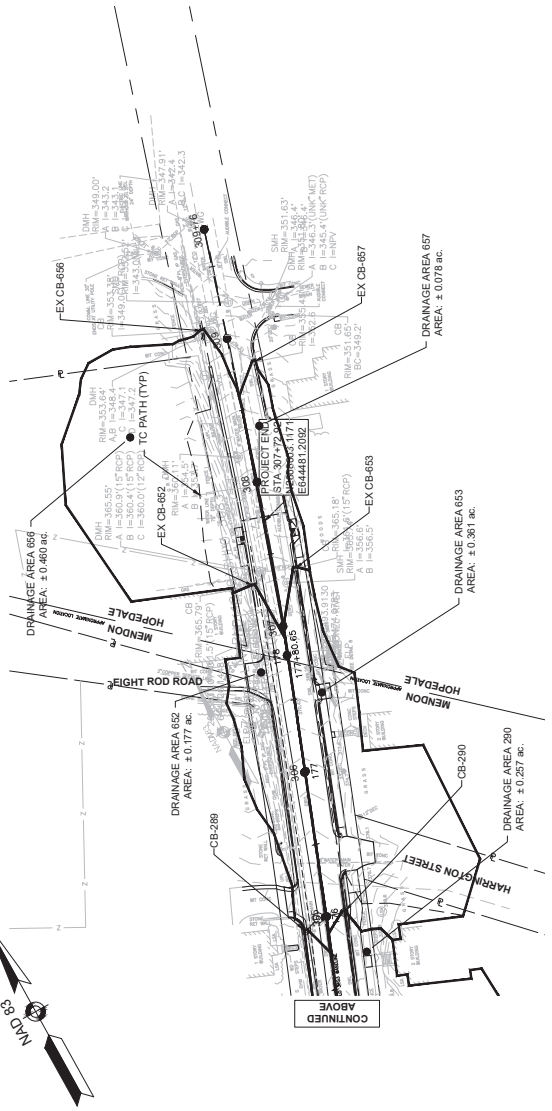
0 40 100 200
SCALE: 1" = 40'


N
NAD 83
DRAINAGE AREA 301 AREA: ± 0.076 ac.
CB-147
AREA DRAIN
CB-299
DRAINAGE AREA 299 AREA: ± 0.174 ac.
AREA DRAIN
CB-145
DRAINAGE AREA 145 AREA: ± 0.342 ac.
CONTINUED BELOW
ROUTE 16/HASTINGS STREET
DRAINAGE AREA 139 AREA: ± 0.084 ac.
CB-139
DRAINAGE AREA 131 AREA: ± 0.310 ac.
DRAINAGE AREA 134 AREA: ± 0.338 ac.
AREA DRAIN
CB-131
CB-134
CB-143
CB-141
CB-144
DRAINAGE AREA 147 AREA: ± 0.170 ac.
DRAINAGE AREA 148 AREA: ± 0.099 ac.
DRAINAGE AREA 144 AREA: ± 0.108 ac.
DRAINAGE AREA 143 AREA: ± 0.023 ac.
CONTINUED ON SHEET NO. 1
CB-132
DRAINAGE AREA 132 AREA: ± 0.042 ac.
DRAINAGE AREA 141 AREA: ± 0.111 ac.
MILLVILLE ROAD
MILFORD STREET (ROUTE 16) DRAINAGE AREAS
N
NAD 83
DRAINAGE AREA 301 AREA: ± 0.076 ac.
DRAINAGE AREA 614 AREA: ± 0.489 ac.
DRAINAGE AREA 154 AREA: ± 0.125 ac.
DRAINAGE AREA 349 AREA: ± 0.085 ac.
DRAINAGE AREA 303 AREA: ± 0.067 ac.
DRAINAGE AREA 350 AREA: ± 0.171 ac.
DRAINAGE AREA 615 AREA: ± 0.079 ac.
EX CB-615
EX CB-614
DRAINAGE AREA 153 AREA: ± 0.087 ac.
DRAINAGE AREA 158 AREA: ± 0.130 ac.
DRAINAGE AREA 163 AREA: ± 0.206 ac.
DRAINAGE AREA 166 AREA: ± 0.095 ac.
GI-163
AREA DRAIN
DRAINAGE AREA 169 AREA: ± 0.189 ac.
DRAINAGE AREA 167 AREA: ± 0.153 ac.
DRAINAGE AREA 173 AREA: ± 0.103 ac.
DRAINAGE AREA 305 AREA: ± 0.128 ac.
DRAINAGE AREA 308 AREA: ± 0.025 ac.
CB-308
CB-173
CB-305
CB-169
CB-307
CB-167
CONTINUED ON SHEET NO. 3
CB-301
CB-349
CB-154
CB-350
CB-303
CB-150
CB-302
CB-148
CB-151
CB-152
CB-159
CB-166
CB-170
DRAINAGE AREA 307 AREA: ± 0.032 ac.
DRAINAGE AREA 618 AREA: ± 0.192 ac.
EX CB-618
EX CB-617
CONTINUED ABOVE
HASTINGS (RTE 16) STREET
MAPLE STREET
EMERSON STREET
TC PATH (TYP)
DRAINAGE AREA 302 AREA: ± 0.063 ac.
DRAINAGE AREA 150 AREA: ± 0.113 ac.
DRAINAGE AREA 151 AREA: ± 0.064 ac.
DRAINAGE AREA 152 AREA: ± 0.056 ac.
DRAINAGE AREA 159 AREA: ± 0.180 ac.
DRAINAGE AREA 162 AREA: ± 0.098 ac.
DRAINAGE AREA 170 AREA: ± 0.109 ac.
DRAINAGE AREA 617 AREA: ± 0.120 ac.
MILFORD STREET (ROUTE 16) DRAINAGE AREAS
MENDON DRAINAGE AREAS
SHEET 2 OF 5
0 40 100 200
SCALE: 1" = 40'


MILFORD STREET (ROUTE 16) DRAINAGE AREAS
MILFORD STREET (ROUTE 16) DRAINAGE AREAS
MENDON DRAINAGE AREAS
SHEET 3 OF 5
SCALE: 1" = 40'
NAD 83
CONTINUED BELOW
CONTINUED ON SHEET NO. 2
CONTINUED ON SHEET NO. 4
CONTINUED ABOVE
MAIN STREET
NORTH AVENUE
ELM STREET
MILFORD (RTE 16) STREET


MENDON DRAINAGE AREAS
SHEET 4 OF 5
SCALE: 1" = 40'
0
40
100
200
MILFORD STREET (ROUTE 16) DRAINAGE AREAS
MILFORD (RTE 16) STREET
CONTINUED BELOW
CONTINUED ON SHEET NO. 3
CONTINUED ON SHEET NO. 5
CONTINUED ABOVE
NAD 83
DRAINAGE AREA 364 AREA: ± 0.090 ac.
DRAINAGE AREA 365 AREA: ± 0.076 ac.
DRAINAGE AREA 366 AREA: ± 0.100 ac.
DRAINAGE AREA 367 AREA: ± 0.083 ac.
DRAINAGE AREA 368 AREA: ± 0.089 ac.
DRAINAGE AREA 369 AREA: ± 0.060 ac.
DRAINAGE AREA 388 AREA: ± 0.089 ac.
DRAINAGE AREA 221 AREA: ± 0.056 ac.
DRAINAGE AREA 220 AREA: ± 0.059 ac.
DRAINAGE AREA 318 AREA: ± 0.031 ac.
DRAINAGE AREA 224 AREA: ± 0.050 ac.
DRAINAGE AREA 229 AREA: ± 0.031 ac.
DRAINAGE AREA 230 AREA: ± 0.039 ac.
DRAINAGE AREA 234 AREA: ± 0.038 ac.
DRAINAGE AREA 236 AREA: ± 0.083 ac.
DRAINAGE AREA 318 AREA: ± 0.081 ac.
DRAINAGE AREA 239 AREA: ± 0.079 ac.
DRAINAGE AREA 243 AREA: ± 0.083 ac.
DRAINAGE AREA 246 AREA: ± 0.097 ac.
DRAINAGE AREA 250 AREA: ± 0.079 ac.
DRAINAGE AREA 253 AREA: ± 0.091 ac.
DRAINAGE AREA 256 AREA: ± 0.097 ac.
DRAINAGE AREA 259 AREA: ± 0.099 ac.
DRAINAGE AREA 264 AREA: ± 0.099 ac.
DRAINAGE AREA 266 AREA: ± 0.149 ac.
DRAINAGE AREA 268 AREA: ± 0.067 ac.
DRAINAGE AREA 263 AREA: ± 0.057 ac.
DRAINAGE AREA 261 AREA: ± 0.042 ac.
DRAINAGE AREA 258 AREA: ± 0.066 ac.
DRAINAGE AREA 371 AREA: ± 0.071 ac.
DRAINAGE AREA 370 AREA: ± 0.059 ac.
DRAINAGE AREA 667 AREA: ± 0.076 ac.
DRAINAGE AREA 363 AREA: ± 0.027 ac.
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MENDON DRAINAGE AREAS
SHEET 5 OF 5

0 40 100 200
SCALE: 1" = 40'

Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)	Catchment Intensity (in/h)	Catchment Rational Flow (cfs)
CB-101	0.160	0.86	0.083	0.99	7.19	0.99
GI-103	0.092	0.60	0.153	0.30	5.43	0.30
CB-106	0.085	0.86	0.083	0.53	7.19	0.53
CB-111	0.271	0.85	0.083	1.67	7.19	1.67
CB-114	0.179	0.90	0.083	1.17	7.19	1.17
CB-115	0.085	0.77	0.083	0.47	7.19	0.47
CB-117	0.109	0.90	0.083	0.71	7.19	0.71
CB-118	0.081	0.77	0.083	0.45	7.19	0.45
CB-120	0.093	0.90	0.083	0.60	7.19	0.60
CB-121	0.085	0.65	0.083	0.40	7.19	0.40
CB-123	0.097	0.90	0.083	0.63	7.19	0.63
CB-124	0.144	0.85	0.083	0.89	7.19	0.89
CB-128	0.127	0.90	0.083	0.83	7.19	0.83
CB-129	0.081	0.77	0.083	0.45	7.19	0.45
CB-131	0.310	0.85	0.083	1.91	7.19	1.91
CB-132	0.042	0.74	0.083	0.23	7.19	0.23
CB-134	0.338	0.88	0.083	2.15	7.19	2.15
CB-139	0.084	0.88	0.083	0.54	7.19	0.54
CB-141	0.111	0.65	0.083	0.52	7.19	0.52
CB-143	0.023	0.73	0.083	0.12	7.19	0.12
CB-144	0.108	0.68	0.083	0.53	7.19	0.53
CB-145	0.342	0.74	0.083	1.83	7.19	1.83
CB-147	0.170	0.84	0.201	0.67	4.64	0.67
CB-148	0.099	0.76	0.083	0.55	7.19	0.55
CB-150	0.113	0.87	0.083	0.71	7.19	0.71
CB-151	0.064	0.74	0.083	0.34	7.19	0.34
CB-152	0.056	0.80	0.083	0.33	7.19	0.33
GI-153	0.087	0.38	0.083	0.24	7.19	0.24
CB-158	0.130	0.90	0.083	0.85	7.19	0.85
CB-159	0.180	0.42	0.182	0.38	4.90	0.38
CB-162	0.098	0.75	0.083	0.53	7.19	0.53
GI-163	0.206	0.88	0.083	1.31	7.19	1.31
CB-166	0.095	0.84	0.083	0.58	7.19	0.58
CB-167	0.153	0.85	0.083	0.94	7.19	0.94
CB-169	0.189	0.81	0.083	1.11	7.19	1.11
CB-170	0.109	0.72	0.083	0.57	7.19	0.57
CB-173	0.103	0.88	0.083	0.65	7.19	0.65
CB-176	0.007	0.90	0.083	0.04	7.19	0.04
CB-177	0.068	0.90	0.083	0.44	7.19	0.44
CB-179	0.043	0.84	0.083	0.26	7.19	0.26
CB-180	0.065	0.83	0.083	0.39	7.19	0.39
CB-181	0.048	0.90	0.083	0.32	7.19	0.32
CB-182	0.104	0.89	0.083	0.67	7.19	0.67
CB-184	0.081	0.90	0.083	0.53	7.19	0.53
CB-185	0.045	0.89	0.083	0.29	7.19	0.29
CB-186	0.329	0.57	0.083	1.35	7.19	1.35
CB-189	0.090	0.90	0.083	0.59	7.19	0.59
CB-190	0.137	0.89	0.083	0.89	7.19	0.89
CB-192	0.343	0.66	0.083	1.63	7.19	1.63
CB-195	0.137	0.89	0.083	0.89	7.19	0.89
CB-198	0.222	0.76	0.083	1.22	7.19	1.22
CB-199	0.063	0.77	0.083	0.35	7.19	0.35
CB-201	0.101	0.78	0.083	0.58	7.19	0.58
CB-202	0.076	0.81	0.083	0.45	7.19	0.45
CB-204	0.099	0.79	0.083	0.57	7.19	0.57
CB-205	0.088	0.84	0.083	0.53	7.19	0.53
CB-207	0.068	0.79	0.083	0.39	7.19	0.39
CB-208	0.052	0.81	0.083	0.30	7.19	0.30
CB-210	0.082	0.77	0.083	0.46	7.19	0.46
CB-211	0.080	0.82	0.083	0.47	7.19	0.47
CB-213	0.140	0.85	0.083	0.86	7.19	0.86
GI-216	0.164	0.81	0.083	0.97	7.19	0.97
CB-218	0.095	0.79	0.083	0.54	7.19	0.54
CB-220	0.059	0.79	0.083	0.33	7.19	0.33
CB-221	0.056	0.79	0.083	0.32	7.19	0.32
GI-224	0.030	0.78	0.083	0.17	7.19	0.17
CB-229	0.031	0.79	0.083	0.18	7.19	0.18
CB-230	0.039	0.79	0.083	0.22	7.19	0.22
CB-234	0.038	0.78	0.083	0.21	7.19	0.21
CB-236	0.083	0.79	0.083	0.47	7.19	0.47
CB-239	0.079	0.84	0.083	0.48	7.19	0.48

Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)	Catchment Intensity (in/h)	Catchment Rational Flow (cfs)
CB-243	0.083	0.81	0.083	0.49	7.19	0.49
CB-246	0.097	0.82	0.083	0.57	7.19	0.57
CB-250	0.079	0.78	0.083	0.45	7.19	0.45
CB-253	0.091	0.80	0.083	0.53	7.19	0.53
CB-256	0.097	0.78	0.083	0.55	7.19	0.55
CB-258	0.066	0.90	0.083	0.43	7.19	0.43
CB-259	0.099	0.81	0.083	0.58	7.19	0.58
CB-261	0.042	0.90	0.083	0.28	7.19	0.28
CB-263	0.057	0.90	0.083	0.37	7.19	0.37
CB-264	0.099	0.81	0.083	0.58	7.19	0.58
CB-266	0.149	0.78	0.083	0.84	7.19	0.84
CB-268	0.067	0.90	0.083	0.44	7.19	0.44
CB-270	0.118	0.90	0.083	0.77	7.19	0.77
CB-271	0.127	0.80	0.083	0.73	7.19	0.73
CB-273	0.041	0.90	0.083	0.27	7.19	0.27
CB-275	0.136	0.80	0.083	0.79	7.19	0.79
CB-276	0.258	0.59	0.179	0.75	4.93	0.75
CB-278	0.097	0.72	0.083	0.51	7.19	0.51
CB-280	0.071	0.46	0.137	0.19	5.85	0.19
CB-281	0.183	0.53	0.083	0.70	7.19	0.70
CB-284	0.155	0.90	0.083	1.01	7.19	1.01
CB-285	0.132	0.53	0.083	0.51	7.19	0.51
CB-286	0.186	0.44	0.270	0.32	3.89	0.32
CB-289	0.079	0.90	0.083	0.52	7.19	0.52
CB-290	0.257	0.45	0.207	0.53	4.56	0.53
CB-292	0.163	0.85	0.083	1.01	7.19	1.01
CB-294	0.119	0.90	0.083	0.78	7.19	0.78
CB-295	0.070	0.77	0.083	0.39	7.19	0.39
CB-297	0.148	0.90	0.083	0.96	7.19	0.96
CB-298	0.113	0.81	0.083	0.66	7.19	0.66
CB-299	0.174	0.78	0.083	0.98	7.19	0.98
CB-301	0.076	0.64	0.083	0.36	7.19	0.36
CB-302	0.063	0.78	0.083	0.36	7.19	0.36
CB-303	0.067	0.75	0.083	0.36	7.19	0.36
CB-305	0.128	0.81	0.083	0.75	7.19	0.75
CB-307	0.032	0.79	0.083	0.18	7.19	0.18
CB-308	0.025	0.90	0.083	0.17	7.19	0.17
CB-310	0.039	0.79	0.083	0.23	7.19	0.23
CB-311	0.119	0.45	0.083	0.39	7.19	0.39
CB-314	0.059	0.78	0.083	0.33	7.19	0.33
CB-316	0.031	0.78	0.083	0.17	7.19	0.17
CB-318	0.081	0.78	0.083	0.46	7.19	0.46
CB-319	0.081	0.51	0.083	0.30	7.19	0.30
CB-320	0.072	0.90	0.083	0.47	7.19	0.47
DI-325	0.108	0.25	0.083	0.19	7.19	0.19
DI-327	0.198	0.15	0.083	0.22	7.19	0.22
DI-329	0.046	0.15	0.083	0.05	7.19	0.05
DI-331	0.269	0.15	0.083	0.29	7.19	0.29
CB-336	0.109	0.73	0.083	0.57	7.19	0.57
CB-344	0.441	0.29	0.320	0.47	3.64	0.47
CB-348	0.062	0.90	0.083	0.40	7.19	0.40
CB-349	0.085	0.36	0.083	0.22	7.19	0.22
CB-350	0.171	0.72	0.083	0.89	7.19	0.89
CB-351	0.017	0.90	0.083	0.11	7.19	0.11
CB-353	0.035	0.90	0.083	0.23	7.19	0.23
CB-355	0.036	0.90	0.083	0.23	7.19	0.23
CB-357	0.077	0.80	0.083	0.45	7.19	0.45
CB-358	0.019	0.90	0.083	0.12	7.19	0.12
CB-359	0.040	0.90	0.083	0.26	7.19	0.26
CB-360	0.085	0.90	0.083	0.56	7.19	0.56
CB-361	0.040	0.90	0.083	0.26	7.19	0.26
CB-362	0.043	0.90	0.083	0.28	7.19	0.28
CB-363	0.027	0.90	0.083	0.18	7.19	0.18
CB-364	0.090	0.90	0.083	0.59	7.19	0.59
CB-365	0.076	0.86	0.083	0.47	7.19	0.47
CB-366	0.100	0.65	0.083	0.47	7.19	0.47
CB-367	0.083	0.90	0.083	0.54	7.19	0.54
CB-368	0.089	0.90	0.083	0.58	7.19	0.58
CB-369	0.060	0.90	0.083	0.39	7.19	0.39
CB-370	0.059	0.90	0.083	0.38	7.19	0.38
CB-371	0.071	0.88	0.083	0.46	7.19	0.46

Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)	Catchment Intensity (in/h)	Catchment Rational Flow (cfs)
EX CB-601	0.182	0.90	0.083	1.19	7.19	1.19
EX CB-603	0.063	0.90	0.083	0.41	7.19	0.41
EX CB-605	0.574	0.51	0.235	1.24	4.19	1.24
EX CB-607	0.187	0.86	0.083	1.16	7.19	1.16
EX CB-614	0.489	0.42	0.126	1.27	6.11	1.27
EX CB-615	0.079	0.58	0.083	0.33	7.19	0.33
EX CB-617	0.120	0.64	0.083	0.56	7.19	0.56
EX CB-618	0.192	0.60	0.114	0.74	6.42	0.74
EX CB-633	0.002	0.15	0.083	0.00	7.19	0.00
EX CB-634	0.003	0.15	0.083	0.00	7.19	0.00
EX CB-650	0.193	0.72	0.083	1.00	7.19	1.00
EX CB-652	0.177	0.66	0.083	0.84	7.19	0.84
EX CB-653	0.361	0.47	0.114	1.09	6.42	1.09
EX CB-656	0.460	0.36	0.157	0.88	5.34	0.88
EX CB-657	0.078	0.77	0.083	0.43	7.19	0.43
EX CB-665	0.214	0.19	0.234	0.17	4.20	0.17
EX CB-667	0.076	0.90	0.083	0.49	7.19	0.49

	TR-55 Sheet Flow Manning's n = 0.80 for woods or 0.40 for grass 2 Year 24 Hr Depth = 3.37 in					TR-55 Shallow Concentrated Flow Grassed Waterway OR Paved					TR-55 Channel Flow Manning's n = 0.40 for grass or 0.01 for pavement Flow area = 1.5 sf Wetted perimeter = 4 ft					
	top elev	bottom elev	Length	Manning's n	Slope (ft/ft)	Length	top elev	bottom elev	Land Cover	Slope (ft/ft)	Manning's n	Length	top elev	bottom elev	Slope (ft/ft)	Time of Conc. (hrs)
CM-103	444.5	442.3	50	0.4	0.04	5	442.3	441.7	GW	0.12	0.01	75	441.7	438.4	0.04	0.153
CM-147	441.1	439	50	0.4	0.04						0.01	32	439	438.1	0.03	0.201
CM-159	433.2	431.7	50	0.4	0.03	122	431.7	426.6	GW	0.04	0.01	17	426.6	425	0.09	0.182
CM-276	382.8	377	50	0.8	0.12	49	377	375.3	GW	0.03	0.01	232	375.3	365	0.04	0.179
CM-280	383	377.8	39	0.8	0.13						0.01	72	377.8	375.7	0.03	0.137
CM-286	380.2	379.5	50	0.4	0.01	20	379.5	379.2	GW	0.01	0.01	60	379.2	378.3	0.01	0.27
CM-290	379.3	378.5	50	0.4	0.02	33	378.5	378	GW	0.02	0.01	118	378	375.9	0.02	0.207
CM-344	439	436	50	0.8	0.06	108	436	425	GW	0.10	0.40	89	425	423.2	0.02	0.32
CM-605	441.8	438.7	50	0.8	0.06	132	438.7	430.6	GW	0.06	0.01	54	430.6	428	0.05	0.235
CM-614	434.3	430.7	50	0.4	0.07	30	430.7	428.7	GW	0.07	0.01	109	428.7	427.1	0.01	0.126
CM-618	410	405.6	50	0.4	0.09	31	405.6	402.9	P	0.09	0.01	160	402.9	394.1	0.05	0.114
CM-653	384	379.3	50	0.4	0.09	22	379.3	376.2	GW	0.14	0.01	232	376.2	365.4	0.05	0.114
CM-656	368	365.8	50	0.4	0.04	82	365.8	357.7	GW	0.10	0.01	54	357.7	353.4	0.08	0.157
CM-665	440.6	437.5	50	0.8	0.06	162	437.5	423.05	GW	0.09						0.234

Appendix C

Catch Basin Spread Analysis

	The HNTB Companies			MADE BY:	DCS	DATE:	3/9/2023						JOB NO.	608491							
HNTB	Insource. Solutions. Partners.			CHECKED BY:	WB	DATE:	3/9/2023						PAGE NO.								
CVS	MENDON - ROUTE 16			BACK CHECKED BY:		DATE:																
											Catch Basin Spread Analysis - 10 Year Storm											
			Elevation (Rim) (ft)		Inlet Location	Inlet Drainage Area (acres)	Inlet C	Local Rational Flow (cfs)	Carryover Rational Flow (cfs)	Total Rational Flow to Inlet (cfs)	Longitudinal Slope (Inlet) (ft/ft)	Road Cross Slope (ft/ft)	Grate Length (ft)	Depth (Gutter) (in)	Capture Efficiency (Calculated) (%)	Bypassed Rational Flow (cfs)	Bypass Target	Spread / Top Width (ft)				
Label	Station	Offset (ft)	Elevation (Rim) (ft)	Inlet Location	Inlet Drainage Area (acres)	Inlet C	Local Rational Flow (cfs)	Carryover Rational Flow (cfs)	Total Rational Flow to Inlet (cfs)	Longitudinal Slope (Inlet) (ft/ft)	Road Cross Slope (ft/ft)	Grate Length (ft)	Depth (Gutter) (in)	Capture Efficiency (Calculated) (%)	Bypassed Rational Flow (cfs)	Bypass Target	Spread (ft)	Allowable Spread (ft)	Spread Check	Spread Difference (ft)		
CB-101	211+21.48	11.5	445.61	On Grade	0.160	0.86	0.99	0.01	1.00	0.021	0.060	2.000	2.100	96.000	0.040	EXCB-607	2.9	6.0	Pass	3.1		
CB-106	212+31.98	10.9	445.19	On Grade	0.085	0.86	0.53	0.00	0.53	0.038	0.060	2.000	2.000	97.800	0.010	CB-101	2.8	6.0	Pass	3.2		
CB-111	215+11.84	10.9	443.26	On Grade	0.271	0.85	1.67	0.00	1.67	0.014	0.041	2.000	2.400	78.900	0.350	CB-292	4.8	6.0	Pass	1.2		
CB-114	217+01.19	-29.5	438.11	On Grade	0.179	0.90	1.17	0.02	1.19	0.018	0.020	2.000	1.900	77.500	0.270	CB-294	5.0	6.0	Pass	1.0		
CB-115	218+01.68	12.1	438.16	On Grade	0.085	0.77	0.47	0.49	0.96	0.018	0.020	2.000	1.400	70.000	0.250	CB-295	5.9	6.0	Pass	0.1		
CB-117	220+58.44	-29.5	433.46	On Grade	0.109	0.90	0.71	0.01	0.72	0.018	0.020	2.000	1.600	81.500	0.170	CB-297	4.5	6.0	Pass	1.5		
CB-118	220+57.90	12.1	433.85	On Grade	0.081	0.77	0.45	0.61	0.61	0.018	0.020	2.000	1.200	77.400	0.140	CB-298	5.0	6.0	Pass	1.0		
CB-120	223+43.03	-29.5	428.96	On Grade	0.093	0.90	0.60	0.25	0.85	0.006	0.030	2.000	1.900	77.900	0.190	CB-320	5.3	6.0	Pass	0.7		
CB-121	223+43.20	11.5	429.26	On Grade	0.085	0.65	0.40	0.22	0.62	0.007	0.030	2.000	1.400	72.800	0.170	CB-319	6.0	6.0	Pass	0.0		
CB-123	224+18.23	-29.5	428.84	On Grade	0.097	0.90	0.63	0.49	1.12	0.030	0.030	2.000	2.400	72.200	0.310	CB-320	6.7	8.0	Pass	1.3		
CB-124	224+17.60	11.5	429.24	On Grade	0.144	0.85	0.89	0.10	0.99	0.003	0.030	2.000	2.000	64.300	0.350	CB-319	8.2	6.0	Fail	2.2		
CB-128	225+20.07	-29.5	429.84	On Grade	0.127	0.90	0.83	0.86	1.69	0.016	0.030	2.000	2.100	71.200	0.490	CB-123	5.7	8.0	Pass	2.3		
CB-129	225+20.81	11.5	430.23	On Grade	0.081	0.77	0.43	0.61	0.92	0.016	0.020	2.000	1.700	80.400	0.180	CB-124	4.7	6.0	Pass	1.3		
CB-131	226+64.50	-29.5	433.52	On Grade	0.310	0.85	1.91	0.76	2.67	0.033	0.030	2.000	2.200	67.900	0.860	CB-128	6.0	8.0	Pass	2.0		
CB-132	226+63.27	11.5	434.01	On Grade	0.042	0.74	0.23	0.00	0.23	0.011	0.030	2.000	0.600	81.100	0.040	CB-129	4.5	6.0	Pass	1.5		
CB-134	228+51.47	-29.5	440.60	On Grade	0.108	0.88	2.15	0.31	2.46	0.033	0.030	2.000	2.100	69.300	0.760	CB-131	5.8	8.0	Pass	2.2		
CB-139	231+43.12	-28.9	445.34	On Grade	0.084	0.88	0.54	0.04	0.58	0.006	0.038	2.000	1.800	88.800	0.060	CB-134	4.0	8.0	Pass	4.0		
CB-141	231+31.93	32.0	447.49	On Grade	0.111	0.65	0.52	0.00	0.52	0.018	0.057	2.000	0.600	92.400	0.250	CB-134	9.0	6.0	Fail	3.0		
CB-143	231+76.02	32.6	447.60	On Grade	0.023	0.73	0.12	0.00	0.12	0.030	0.004	2.000	0.300	64.000	0.040	CB-139	6.7	6.8	Pass	0.1		
CB-144	231+96.43	27.7	447.62	On Grade	0.108	0.68	0.53	0.00	0.53	0.004	0.057	2.000	0.600	39.100	0.320	CB-145	13.3	6.0	Fail	7.3		
CB-145	233+98.59	-29.5	443.67	On Grade	0.162	0.74	1.83	0.32	2.16	0.021	0.030	2.000	2.200	68.500	0.680	CB-299	6.0	8.0	Pass	2.0		
CB-147	234+23.79	-29.0	438.11	On Grade	0.170	0.84	0.92	0.32	0.72	0.020	0.030	2.000	1.400	86.000	0.010	CB-301	4.0	8.0	Pass	4.0		
CB-148	236+64.00	11.5	437.36	On Grade	0.099	0.76	0.55	0.00	0.55	0.017	0.030	2.000	1.000	76.300	0.130	CB-150	4.8	6.0	Pass	1.2		
CB-150	237+62.59	11.5	434.62	On Grade	0.113	0.87	0.71	0.12	0.83	0.027	0.020	2.000	1.200	75.100	0.210	CB-302	5.2	6.0	Pass	0.8		
CB-151	238+57.79	11.5	432.02	On Grade	0.064	0.74	0.34	0.10	0.45	0.027	0.020	2.000	1.000	85.000	0.070	CB-303	4.1	6.0	Pass	1.9		
CB-152	239+56.99	11.5	428.87	On Grade	0.056	0.80	0.33	0.06	0.39	0.039	0.020	2.000	0.900	89.300	0.040	CB-159	3.6	6.0	Pass	2.4		
CB-158	241+51.69	-25.5	430.23	On Grade	0.190	0.90	0.54	0.02	0.56	0.004	0.030	2.000	1.100	94.800	0.030	CB-161	3.0	8.0	Pass	5.0		
CB-159	240+32.10	38.6	425.00	On Grade	0.180	0.42	0.38	0.03	0.40	0.016	0.056	2.000	1.500	99.700	0.000	O-15	2.3	6.0	Pass	3.7		
CB-162	243+21.80	107.7	405.20	On Grade	0.098	0.79	0.80	0.00	0.81	0.076	0.030	2.000	0.900	99.100	0.000	EX-617	2.4	6.0	Pass	4.1		
GI-163	242+71.73	-25.3	412.34	On Grade	0.206	0.88	1.20	0.04	1.24	0.054	0.030	2.000	1.500	84.200	0.200	CB-166	4.1	6.0	Pass	1.9		
CB-166	243+26.05	-23.9	405.74	On Grade	0.095	0.84	0.52	0.19	0.71	0.093	0.030	2.000	1.100	95.000	0.040	CB-167	3.0	8.0	Pass	5.0		
CB-167	244+34.28	-21.9	403.10	On Grade	0.153	0.85	0.75	0.03	0.78	0.051	0.030	2.000	1.300	90.400	0.080	CB-169	3.5	8.0	Pass	4.5		
CB-169	245+49.21	-19.1	397.96	On Grade	0.189	0.81	1.00	0.08	1.08	0.033	0.030	2.000	1.500	82.900	0.180	CB-305	4.3	8.0	Pass	3.7		
CB-173	247+28.09	-15.0	394.82	On Grade	0.103	0.88	0.65	0.17	0.82	0.010	0.030	2.000	1.700	80.300	0.160	CB-308	4.8	6.0	Pass	1.2		
CB-176	247+86.38	-14.4	394.65	In Sag	0.007	0.90	0.04	0.00	0.11	0.000	0.030	2.000	0.900	100.000	0.000	O-10	2.4	6.0	Pass	3.6		
CB-177	248+09.34	-14.4	394.73	On Grade	0.068	0.90	0.44	0.02	0.46	0.000	0.030	2.000	1.000	86.500	0.060	CB-176	4.3	8.0	Pass	3.7		
CB-179	247+93.04	12.0	394.50	On Grade	0.043	0.84	0.26	0.00	0.26	0.009	0.020	2.000	1.100	84.700	0.040	CB-180	4.7	6.0	Pass	1.3		
CB-180	248+21.28	12.0	394.43	In Sag	0.065	0.83	0.39	0.11	0.51	0.000	0.020	2.000	1.400	100.000	0.000	O-09	5.9	6.0	Pass	0.1		
CB-181	249+68.70	-14.4	396.36	On Grade	0.048	0.90	0.32	0.02	0.34	0.013	0.030	2.000	1.200	93.600	0.020	CB-177	3.3	8.0	Pass	4.7		
CB-182	249+58.90	12.0	395.88	On Grade	0.104	0.89	0.67	0.04	0.71	0.013	0.020	2.000	1.300	73.400	0.190	CB-310	5.6	6.0	Pass	0.4		
CB-184	250+78.67	-15.9	397.83	On Grade	0.081	0.90	0.38	0.00	0.38	0.013	0.030	2.000	1.100	95.300	0.010	CB-181	3.1	8.0	Pass	4.9		
CB-185	251+15.26	12.0	397.95	On Grade	0.045	0.89	0.29	0.00	0.29	0.013	0.020	2.000	1.000	87.500	0.040	CB-182	4.0	6.0	Pass	2.0		
CB-186	254+98.43	-28.8	389.92	On Grade	0.197	1.00	1.47	0.12	1.60	0.030	0.030	2.000	1.600	80.000	0.310	CB-192	6.5	6.0	Fail	0.5		
CB-189	253+30.57	12.1	396.69	On Grade	0.090	0.90	0.59	0.00	0.59	0.025	0.020	2.000	1.100	80.300	0.120	CB-190	4.6	6.0	Pass	1.4		
CB-190	254+86.35	12.1	393.22	On Grade	0.197	0.89	1.56	0.00	1.56	0.044	0.020	2.000	1.700	79.300	0.320	CB-195	6.6	6.0	Fail	0.6		
CB-192	256+40.14	-27.6	383.73	On Grade	0.343	0.66	1.63	0.30	1.93	0.027	0.050	2.000	2.400	85.700	0.280	CB-195	4.0	8.0	Pass	4.0		
CB-195	257+27.87	-25.0	378.99	On Grade	0.137	0.89	1.00	0.93	1.93	0.064	0.030	2.000	1.300	89.600	0.210	CB-198	3.6	8.0	Pass	4.4		
CB-198	258+96.49	-25.0	366.97	On Grade	0.222	0.76	1.22	0.14	1.36	0.072	0.030	2.000	1.400	84.900	0.210	CB-201	4.0	8.0	Pass	4.0		
CB-199	258+96.49	12.0	367.26	On Grade	0.063	0.77	0.35	0.00	0.35	0.000	0.020	2.000	0.700	94.000	0.020	CB-202	3.1	6.0	Pass	2.9		
CB-201	260+17.19	-25.0	356.81	On Grade	0.101	0.78	0.58	0.21	0.78	0.072	0.030	2.000	1.200	92.600	0.030	CB-204	3.3	8.0	Pass	4.7		
CB-202	260+34.38	11.4	357.21	On Grade	0.076	0.81	0.45	0.02	0.47	0.072	0.020	2.000	0.800	90.600	0.040	CB-205	3.5	6.0	Pass	2.5		
CB-204	261+74.44	-24.5	346.01	On Grade	0.079	0.79	0.57	0.00	0.63	0.072	0.030	2.000	1.100	95.000	0.030	CB-207	3.0	8.0	Pass	5.0		
CB-205	261+76.25	12.6	347.04	On Grade	0.088	0.84	0.53	0.18	0.72	0.020	0.020	2.000	0.900	87.600	0.070	CB-208	3.7	6.0	Pass	2.3		
CB-207	262+66.54	-21.1	340.32	On Grade	0.068	0.79	0.39	0.03	0.42	0.072	0.020	2.000	0.900	98.300	0.010	CB-210	2.6	8.0	Pass	5.4		
CB-208	262+65.92	12.6	340.59	On Grade	0.052	0.81	0.30	0.07	0.37	0.072	0.020	2.000	0.800	93.300	0.020	CB-211	3.2	6.0	Pass	2.8		
CB-210	263+98.19	-16.3	330.91	On Grade	0.082	0.77	0.46	0.01	0.46	0.030	0.030	2.000	1.000	97.600	0.010	CB-355	2.7	8.0	Pass	5.3		
CB-211	263+98.25	12.8	331.01	On Grade	0.080	0.82	0.47	0.03	0.50	0.072	0.020	2.000	0.800	89.700	0.050	CB-357	3.5	6.0	Pass	2.5		
CB-213	266+72.41	-14.4	310.94	On Grade	0.140	0.85	0.86	0.05	0.91	0.066	0.030	2.000	1.300	90.000	0.090	CB-359	3.5	8.0	Pass	4.5		
CB-218	270+64.17	12.0	284.81	On Grade	0.095	0.79	0.54	0.20	0.74	0.055	0.030	2.000	1.000	82.000	0.130	CB-214	4.3	6.0	Pass	1.7		
CB-220	272+50.44	12.0	276.36	On Grade	0.059	0.79	0.33	0.06	0.39	0.033	0.020	2.000	0.900	87.900	0.050	CB-221	3.8	6.0	Pass	2.2		
CB-221	273+42.66	12.0	273.90	On Grade	0.056	0.79	0.32	0.05	0.37	0.021	0.020	2.000	1.000	86.500	0.050	CB-316	4.0	6.0	Pass	2.0		
CB-229	274+83.22	12.0	272.00	On Grade	0.031	0.79	0.18	0.02	0.19	0.016	0.020	2.000	1.000	89.400	0.020	CB-230	4.3	6.0	Pass	1.7		
CB-230	275+26.55	12.0	271.93	In Sag	0.039	0.79	0.22	0.09	0.31	0.000	0.020	2.000	1.100	100.000	0.000	O-07	4.7	6.0	Pass	1.3		
CB-234	275+57.75	12.0	272.00	On Grade	0.038	0.78	0.21	0.14	0.35	0.004	0.020	2.000	1.300	80.300	0.070	CB-233	5.4	6.0	Pass	0.6		
CB-236	276+20.72	12.0	272.46	On Grade	0.083	0.79	0.47	0.10	0.57	0.011	0.020	2.000	1.300	76.000	0.140	CB-234	5.3	6.0	Pass	0.7		
CB-239	278+02.32	11.9	273.77	On Grade	0.079	0.84	0.48	0.09	0.57	0.011	0.020	2.000	1.000	84.200	0.090	CB-238	4.1	6.0	Pass	1.9		
CB-243	280+24.31	12.0	286.00	On Grade	0.083	0.81	0.69	0.11	0.80	0.048	0.020	2.000	1.000	84.400	0.090	CB-239	4.1	6.0	Pass	1.9		
CB-246	281+66.31	12.0	292.84	On Grade	0.097	0.82	0.57	0.08	0.66	0.048	0.020	2.000	1.000	82.900	0.110	CB-243	4.2	6.0	Pass	1.8		
CB-250	283+33.73	12.0	300.01	On Grade	0.078	0.90	0.65	0.11	0.76	0.048	0.020	2.000	1.000	85.400	0.080	CB-246	4.0	6.0	Pass	2.0		
CB-253	284+67.76	12.0	307.37	On Grade	0.091	0.80	0.53	0.13	0.66	0.048	0.020	2.000	1.000	82.900	0.110	CB-250	4.2	6.0	Pass	1.8		
CB-256	286+03.07	12.0	314.86	On Grade	0.097	0.78	0.55	0.15	0.70	0.048	0.020	2.000	1.000	81.900	0.130	CB-253	4.3	6.0	Pass	1.7		
CB-258	287+88.28	-14.4	322.75	On Grade	0.066	0.90	0.43	0.00	0.43	0.048	0.030	2.000	1.000	96.700	0.010	CB-371	2.8	8.0	Pass	5.2		
CB-259	287+88.25	12.0	322.82	On Grade	0.031	0.81	0.18	0.02	0.20	0.016	0.020	2.000	1.000	89.500	0.020	CB-255	4.5	6.0	Pass	1.5		
CB-261	289+51.32	-15.6	330.57	On Grade	0.062	0.90	0.28	0.01	0.29	0.048	0.030	2.000	0.900	99.200	0.000	CB-258	2.4	8.0	Pass	5.6		
CB-263	290+62.92	-15.6	335.95	On Grade	0.057	0.90	0.37	0.03	0.40	0.048	0.030	2.000	1.000	97.600	0.010	CB-261	2.7	8.0	Pass	5.3		
CB-264	289+57.16	12.0	330.96	On Grade	0.099	0.81	0.58	0.27	0.85	0.048	0.020	2.000	1.100	78.700	0.180	CB-259	4.7	6.0	Pass	1.3		
CB-266	291+26.92	12.0	339.14	On Grade	0.149	0.78	0.84	0.22	1.06	0.048	0.020	2.000	1.200	75.000	0.270	CB-264	5.1	6.0	Pass	0.9		
CB-268	292+03.67	-15.0	342.01	On Grade	0.067	0.90	0.44	0.08	0.52	0.048	0.030	2.000	1.100	95.100	0.030	CB-263	3.0	8.0	Pass	5.0		
CB-270	293+77.53	-15.0	351.13	On Grade	0.118	0.90	0.77	0.01	0.78	0.048	0.030	2.000	1.300	90.200	0.080	CB-268	3.5	8.0	Pass	4.5		
CB-271	293+78.70	12.0	351.33	On Grade	0.073	0.90	0.95	0.22	1.17	0.048	0.020	2.000	1.200	76.900	0.270	CB-266	4.9	6.0	Pass	1.1		
CB-273	295+53.95	-15.0	359.64	On Grade	0.041	0.90	0.27	0.11	0.38	0.048	0.030	2.000	1.000	97.700	0.010	CB-270	2.7	8.0	Pass	5.3		
CB-275	295+96.30	12.0	361.72	On Grade	0.020	0.79	0.14	0.15	0.29	0.048	0.020	2.000	1.200	77.000	0.420	CB-271	4.0	6.0	Pass	2.0		
CB-276	296+63.51	-15.0	364.92	On Grade	0.258	0.59	0.75	0.02	0.78	0.048	0.030	2.000	1.300	90.300	0.080	CB-273	3.5	8.0	Pass	4.5		
CB-278	298+53.62	12.0	373.12	On Grade	0.097	0.72	0.51	0.24	0.75	0.043	0.020	2.000	1.100	79.900	0.150	CB-275	4.6	6.0	Pass	1.4		
CB-280	299+10.28	-15.6	375.72	On Grade	0.071	0.86	0.38	0.27	0.65	0.028	0.030	2.000	1.200	83.000	0.110	CB-276	3.2	8.0	Pass	4.8		
CB-281	299+88.28	12.0	377.43	On Grade	0.183	0.53	0.70	0.13	0.82	0.013	0.020	2.000	1.400	71.000	0.240	CB-278	5.9	6.0	Pass	0.1		
CB-284	301+16.34	11.6	378.20	On Grade	0.155	0.90	1.01	0.00	1.01	0.005	0.030	2.000	2.000	74.600	0.260	EX-CB-650	5.9	6.0	Pass	0.1		
CB-285	301+65.80	12.0	378.51	On Grade	0.132	0.53	0.51	0.00	0.51	0.005	0.020	2.000	1.400	75.300	0.130	CB-281	5.8	6.0	Pass	0.2		
CB-286	300+65.82	12.0	378.28	On Grade	0.186	0.32	0.48	0.00	0.48	0.014	0.020	2.000	1.000	86.200	0.060	CB-285	4.1	6.0	Pass	1.9		
CB-289	304+91.80	-15.6	375.99	On Grade	0.079	0.90	0.52	0.00	0.52	0.027	0.030	2.000	1.200	92.200	0.040	EX-CB-652	3.3	8.0	Pass	4.7		
CB-290	305+61.12	12.0	375.84	On Grade	0.257	0.45	0.52	0.05	0.58	0.029	0.020	2.000	1.100	81.500	0.110	EX-CB-653	4.4	6.0	Pass	1.6		
CB-292	214+55.87	12.1	440.00	On Grade	0.163	1.01	0.35	0.00	0.35	0.018	0.020	2.000	1.600	64.200	1.36	11.15	6.7	6.0	Fail	0.7		
CB-294	219+31.33	-29.5	435.69	On Grade	0.119	0.90	0.78	0.27	1.04	0.018	0.020	2.000	1.700	79.500	0.210	CB-117	4.7	8.0	Pass	3.3		
CB-295	219+24.92	12.1	436.18	On Grade	0.070	0.77	0.39	0.29	0.67	0.018	0.020	2.000	1.200	75.800	0.160	CB-118	5.2	6.0	Pass	0.8		
CB-297	222+33.78	-29.5	430.39	On Grade	0.196	0.90	0.96	0.17	1.14	0.030	0.030	2.000	1.800	78.200	0.250	CB-120	4.9	8.0	Pass	3.1		
CB-298	222+27.24	11.5	430.89	On Grade	0.113	0.81	0.66	0.14	0.80	0.018	0.030	2.000	1.300	73.000	0.215	CB-121	5.5	6.0	Pass	0.5		
CB-299	225+11.30	-29.5	449.79	On Grade	0.174	0.78	0.98	0.68	1.66	0.020	0.030	2.000	2.000	72.700	0.650	CB-147	5.5	8.0	Pass	2.5		
CB-301	236+61.67	-28.7	437.54	On Grade	0.076	0.90	0.64	0.20	0.84	0.020	0.030	2.000	1.300	89.500	0.090	CB-149	3.7	6.0	Pass	2.3		
CB-302	238+10.45	11.5	433.31	On Grade	0.063	0.78	0.36	0.21	0.56	0.020	0.020	2.000	1.100	81.500	0.100	CB-151	4.5	6.0	Pass	1.5		
CB-303	239+06.54	11.5	430.64	On Grade	0.067	0.75	0.36	0.07	0.43	0.020	0.020	2.000	0.900	86.600	0.060	CB-152	3.9	6.0	Pass	2.1		
CB-305	240+48.60	17.0	395.88	On Grade	0.128	0.81	0.73	0.21	0.93	0.031	0.030	2.000	1.600	82.100	0.170	CB-173	4.4	8.0	Pass	3.6		
CB-307	247+27.80	12.0	395.11	In Sag	0.032	0.79	0.19	0.00	0.18	0.000	0.020	2.000	0.900	100.000	0.000	O-07	2.3	6.0	Pass	3.7		
CB-308	247+53.05	-15.0	394.72	In Sag	0.025	0.90	0.17	0.16	0.33	0.000	0.030	2.000	1.300	100.000	0.000	O-08	3.6	8.0	Pass	4.4		
CB-310	248+89.06	12.0	394.96	On Grade	0.039	0.79	0.23	0.19	0.41	0.013	0.020	2.000	1.100	81.900	0.070	CB-180	4.6	6.0	Pass	1.4		
CB-311	250+74.17	-108.8	389.06	On Grade	0.119	0.60	0.39	0.03	0.42	0.029	0.038	2.000	1.200	88.500	0.050	CB-182	3.6	8.0	Pass	4.4		
CB-314	271+52.39	12.0	280.08	On Grade	0.059	0.78	0.33	0.13	0.47	0.044	0.020	2.000	0.800	87.400	0.060	CB-220	3.8	6.0	Pass	2.2		
CB-316	273+92.68	12.0	272.98	On Grade	0.031	0.78	0.17	0.05	0.22	0.016	0.020	2.000	0.800	91.500	0.050	GI-224	3.5	6.0	Pass	2.5		
CB-318	277+58.85	12.0	275.11	On Grade	0.081	0.78	0.46	0.09	0.55	0.027	0.020	2.000	1.100	81.800	0.150	CB-316	4.4	6.0	Pass	1.6		
CB-319	223+93.64	11.5	429.19	In Sag	0.081	0.51	0.30	0.52	0.82	0.000	0.020	2.000	1.900	100.000	0.000	O-17	6.0	6.0	Fail	1.7		
CB-320	223+95.77	-29.5	428.80	In Sag	0.072	0.90	0.47	0.50	0.97	0.000	0.020	2.000	2.000	100.000	0.000	O-18	6.1	6.0	Pass	1.9		
CB-336	253+09.06	-25.5	397.78	On Grade	0.109	0.73	0.52	0.00	0.57	0.021	0.020	2.000	1.100	79.600	0.120	CB-186	4.7	8.0	Pass	3.3		
CB-344	206+56.06	47.0	423.20	In Sag	0.441	0.29	0.58	0.00	0.58	0.000	0.020	2.000	1.900	100.000	0.000	O-04	6.4	6.0	Fail	0.4		
CB-348	215+32.83	-29.5	444.01	On Grade	0.062	0.90	0.40	0.00	0.40	0.027	0.030	2.000	1.100	94.900	0.020	CB-114	3.1	8.0	Pass	4.9		
CB-349	237+67.33	-28.5	435.14	On Grade	0.085	0.36	0.22	0.16	0.28	0.027	0.030	2.000	1.000	97.900	0.010	CB-350	2.7	8.0	Pass	5.3		
CB-350	239+55.61	-28.5	429.31	On Grade	0.171	0.72	0.89	0.01	0.90	0.046	0.030	2.000	1.300	87.900	0.110	CB-353	3.7	8.0	Pass	4.3		
CB-351	212+31.28	-36.0	447.76	On Grade	0.017	0.90	0.11	0.00	0.11	0.008	0.030	2.000	0.900	99.500	0.000	O-14	2.4	8.0	Pass	5.6		
CB-353	256+16.85	-92.7	387.78	On Grade	0.035	0.90	0.23	0.00	0.23	0.036	0.030	2.000	0.900	99.900	0.000	CB-192	2.2	6.4	Pass	4.2		
CB-355	264+78.64	-15.0	325.13	On Grade	0.036	0.90	0.23	0.01	0.25	0.067	0.030	2.000	0.800	99.900	0.000	CB-213	2.1	8.0

Appendix D

Pipe Sizing Design Analysis

HNTB	The HNTB Companies Engineers Architects Planners	MADE BY	DCS		3/9/2023											JOB NO.	608491					
		CHECKED BY	WJS		3/14/2023											PAGE NO.						
FOR	ROUTE 16 MINOON	BACKCHECKED BY	DCS		3/14/2023																	
											Conduit Analysis											
Network Outfall	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Material	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Slope (Calculated) (ft/ft)	Capacity (Design) (cfs)	Flow (cfs)	Flow / Capacity (Design) (%)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Depth to HGL (ft) In	Depth to HGL (ft) Out
EX OUTFALL-50	EX CB-603	DMH-345	19	12	CMP	419.90	419.50	434.07	423.67	3.17	3.17	0.021	2.82	0.41	14.60	2.56	420.17	3.90	3.77
EX OUTFALL-50	DMH-345	EX CB-665	13	12	Concrete	419.50	419.20	423.67	424.36	3.17	4.16	0.023	5.43	0.82	15.20	4.99	419.88	3.79	4.89
EX OUTFALL-50	EX CB-665	EX DMH-602	26	12	Concrete	419.10	418.90	424.36	423.94	4.26	4.04	0.008	3.14	0.78	24.80	3.31	419.47	4.89	4.61
EX OUTFALL-50	EX DMH-602	DMH-100	76	12	Concrete	418.70	414.63	423.94	420.42	4.24	4.79	0.053	8.24	1.72	20.80	8.29	419.26	4.68	4.55
EX OUTFALL-50	DMH-100	EX DMH-603	162	12	Concrete	414.63	406.10	420.42	413.22	4.79	6.12	0.053	8.17	6.05	74.10	11.38	415.59	4.83	4.74
EX OUTFALL-50	EX DMH-600	EX OUTFALL-50	27	12	Concrete	405.90	402.34	413.22	403.57	6.32	N/A	0.133	13.01	6.57	50.50	16.61	406.87	6.35	N/A
EX OUTFALL-50	EX CB-601	EX DMH-600	9	12	Concrete	409.30	409.00	413.52	413.22	3.22	3.22	0.035	13.70	1.17	13.40	7.72	409.76	3.76	3.92
EX OUTFALL-50	EX CB-605	EX DMH-604	4	12	Concrete	422.60	422.50	427.49	427.46	3.89	3.96	0.027	5.86	1.25	21.30	5.93	423.07	4.42	4.59
FES-1	EX DMH-606	DMH-102	47	12	Concrete	433.70	431.44	440.19	438.51	5.49	6.07	0.048	7.85	5.02	64.00	6.19	436.69	3.50	2.75
FES-1	EX CB-607	EX DMH-606	4	12	Concrete	435.70	433.70	440.19	440.19	3.63	5.49	0.476	24.58	1.16	4.70	1.48	437.36	2.97	2.84
HW-1	DMH CIT-138	DMH CIT-133	243	12	CMP	441.40	436.20	445.93	440.52	3.53	3.32	0.021	2.82	1.05	37.20	3.33	441.83	4.10	3.90
HW-1	DMH-140	DMH CIT-138	23	12	Concrete	442.50	441.60	446.56	445.93	3.06	3.33	0.038	6.99	0.55	7.90	5.31	442.81	3.75	4.14
EX OUTFALL-51	EX DMH-608	DMH-300	63	12	Concrete	436.60	435.36	440.84	440.34	4.97	4.48	0.020	4.98	1.47	29.50	5.52	437.11	5.46	4.72
EX OUTFALL-51	DMH-300	DMH-340	58	12	Concrete	435.36	434.18	440.84	439.35	4.48	4.17	0.020	5.07	2.64	52.00	6.52	436.06	4.78	4.09
EX OUTFALL-51	DMH-340	DMH-146	41	12	Concrete	434.18	433.35	439.35	438.21	4.17	3.86	0.020	5.08	4.73	93.00	7.35	435.08	4.27	3.90
EX OUTFALL-51	DMH-146	EX DMH-610	27	12	Concrete	433.35	432.80	438.21	437.58	3.86	3.78	0.021	5.10	4.03	79.00	7.21	434.20	4.01	4.09
EX OUTFALL-51	EX DMH-610	DMH-149	109	12	Concrete	432.60	429.65	437.58	435.06	3.98	4.41	0.027	5.87	4.48	76.20	8.23	433.49	4.09	4.28
EX OUTFALL-51	DMH-149	DMH-322	84	12	Concrete	429.65	427.40	435.06	432.76	4.41	4.36	0.027	5.84	4.90	83.90	8.33	430.56	4.50	4.66
EX OUTFALL-51	CB-151	DMH-322	32	12	Concrete	427.10	426.80	432.02	432.76	3.92	4.95	0.009	3.47	0.38	11.00	2.91	427.36	4.66	5.47
EX OUTFALL-51	DMH-322	DMH-304	37	12	Concrete	426.30	424.94	432.76	431.48	5.45	5.54	0.036	6.80	5.29	77.80	9.57	427.23	5.53	5.44
EX OUTFALL-51	DMH-304	EX DMH-612	73	12	Concrete	424.94	422.30	431.48	428.44	5.54	5.14	0.036	6.76	5.46	80.80	9.58	425.88	5.60	4.87
EX OUTFALL-51	CB-152	EX DMH-612	24	12	Concrete	423.80	422.30	428.44	428.44	4.07	5.14	0.063	8.96	0.34	3.80	5.50	424.04	4.83	4.88
EX OUTFALL-51	EX CB-614	EX DMH-613	47	12	PVC	424.50	424.30	429.02	428.11	3.52	2.81	0.004	3.01	4.46	148.40	5.68	425.81	3.21	2.74
EX OUTFALL-51	EX CB-615	EX CB-614	25	12	PVC	424.90	424.80	427.37	429.02	1.47	3.22	0.004	2.92	0.31	10.50	0.19	426.12	1.25	2.92
EX OUTFALL-52	DMH CIT-160	CC-5	146	12	Concrete	415.20	407.00	420.34	408.23	4.90	N/A	0.056	8.45	0.40	4.70	5.51	415.46	5.04	N/A
EX OUTFALL-52	CC-5	DMH-352	94	12	Concrete	407.00	401.25	408.23	404.79	N/A	2.54	0.061	8.83	0.39	4.40	5.64	407.26	N/A	3.08
EX OUTFALL-52	DMH-352	EX CB-617	194	12	Concrete	401.25	389.50	404.79	393.43	2.54	2.93	0.061	8.77	0.98	11.20	7.37	401.67	3.12	3.70
EX OUTFALL-52	EX CB-618	EX CB-617	29	15	CMP	391.40	389.20	394.05	393.43	1.40	2.98	0.077	9.69	0.67	6.90	4.52	391.72	2.33	3.80
EX OUTFALL-51	DMH CIT-164	EX DMH-619	11	12	CMP	409.90	409.80	414.36	414.57	3.46	3.77	0.009	1.87	1.04	55.40	2.45	410.71	3.65	3.89
EX OUTFALL-51	CC-3	DMH-168	3	12	Concrete	398.50	398.43	400.11	403.27	N/A	3.84	0.023	5.35	0.71	13.20	0.90	400.08	N/A	3.19
EX OUTFALL-51	EX CB-623	EX CB-621	53	48	Concrete	385.30	385.00	394.12	394.26	4.82	5.26	0.006	108.17	18.57	17.20	6.43	388.01	6.11	6.25
EX OUTFALL-51	EX CB-621	EX OUTFALL-51	142	48	Concrete	385.00	384.00	394.26	388.92	5.26	N/A	0.007	120.66	18.54	15.40	6.95	388.01	6.25	N/A
EX OUTFALL-51	DMH-178	EX CB-623	100	15	Concrete	389.80	387.10	395.02	394.12	3.96	5.77	0.027	10.64	3.79	35.60	7.94	390.59	4.43	6.32
FES-3	EX DMH-628	DMH CIT-188	19	15	Concrete	386.60	384.00	394.62	390.60	6.77	3.35	0.032	11.57	5.39	46.60	9.26	387.54	7.08	3.93
FES-3	DMH-191	EX DMH-629	61	12	Concrete	383.30	380.60	388.93	385.56	4.63	3.96	0.044	7.50	3.44	45.90	9.34	384.09	4.84	3.24
FES-3	EX DMH-629	DMH-335	31	15	Concrete	380.60	378.58	385.56	384.12	3.71	4.29	0.064	16.37	10.19	62.20	14.06	381.79	3.77	4.07
FES-3	DMH-335	EX DMH-630	127	15	Concrete	378.58	371.10	384.12	376.73	4.29	4.18	0.059	15.68	11.44	73.00	13.94	379.79	4.33	3.75
FES-3	DMH CIT-196	EX DMH-630	15	15	Concrete	373.20	371.10	376.70	376.73	2.25	4.18	0.143	24.41	3.71	15.20	14.17	373.98	2.72	4.06
FES-3	CB-205	DMH-203	2	15	Concrete	341.91	341.80	347.04	346.84	3.88	3.79	0.055	15.15	0.90	3.10	0.41	343.81	3.23	3.03
FES-3	DMH-203	DMH-206	86	15	Concrete	341.40	335.00	346.84	340.14	3.99	1.89	0.076	17.85	17.11	95.80	16.56	342.84	4.00	4.14
FES-8	EX CB-633	EX CB-634	63	15	Concrete	301.30	299.50	307.79	301.51	5.24	0.76	0.029	10.93	0.00	0.00	0.80	301.32	6.47	2.00
FES-6	CB-218	EX DMH-635	4	12	Concrete	279.15	279.10	284.81	284.70	4.66	4.60	0.012	3.89	0.60	15.50	3.60	279.47	5.34	5.32
FES-6	EX DMH-635	DMH-313	92	12	Concrete	278.40	275.00	284.70	279.97	5.10	3.97	0.039	7.05	1.13	16.10	6.58	279.05	5.65	4.32
FES-6	DMH-313	EX DMH-636	93	12	Concrete	275.00	271.30	279.97	276.30	3.97	4.00	0.040	7.11	1.80	25.30	7.55	275.57	4.40	4.66
FES-6	EX DMH-636	EX DMH-637	4	12	Concrete	271.30	271.00	276.30	276.08	4.20	4.08	0.024	5.56	2.11	38.00	6.60	271.81	4.49	4.22
FES-6	EX DMH-637	CC-4	20	12	Concrete	271.00	270.20	276.08	272.04	4.08	N/A	0.040	7.16	2.38	33.20	8.19	271.66	4.42	N/A
FES-7	DMH CIT-223	EX DMH-641	30	12	Concrete	269.20	267.20	272.82	272.57	2.62	4.37	0.067	9.21	0.67	7.30	6.84	269.54	3.28	5.19
FES-7	DMH CIT-228	EX DMH-641	12	12	Concrete	267.90	267.10	272.51	272.57	3.61	4.47	0.065	9.09	0.48	5.30	6.12	268.19	4.32	5.07
FES-5	DMH CIT-213	EX DMH-643	23	12	Concrete	268.00	267.00	272.49	272.49	3.60	4.49	0.043	7.41	0.71	9.50	5.95	268.38	4.02	3.90
EX HW-646	DMH-332	EX HW-646	21	24	Concrete	352.10	351.90	359.07	353.57	4.97	N/A	0.010	22.34	1.99	17.90	5.38	353.90	5.17	N/A
EX HW-646	DMH-274	DMH-272	48	15	Concrete	356.02	353.30	362.18	359.69	4.91	5.14	0.057	15.38	3.76	24.40	10.34	356.80	5.38	5.97
EX HW-646	EX DMH-647	DMH-274	50	15	Concrete	358.90	356.02	364.79	362.18	4.64	4.91	0.057	15.46	3.28	21.20	10.00	359.63	5.36	5.34
EX HW-646	CB-276	EX DMH-647	34	12	Concrete	360.10	359.30	364.92	364.79	3.82	4.49	0.024	5.49	0.70	12.70	4.79	360.45	4.47	5.11
EX HW-646	EX DMH-648	DMH-279	82	15	Concrete	371.00	366.00	377.78	373.15	5.53	6.06	0.037	12.36	2.55	20.60	7.94	371.64	6.14	6.92
EX HW-646	EX CB-650	DMH-282	18	15	Concrete	371.80	371.34	377.37	377.47	4.32	4.88	0.026	10.41	0.94	9.10	5.27	372.18	5.19	5.53
EX HW-646	DMH-282	EX DMH-648	5	15	Concrete	371.34	371.20	377.47	377.78	4.88	5.33	0.027	10.70	1.99	18.60	6.67	371.90	5.57	5.99
EX DMH-658	EX CB-652	EX DMH-651	7	15	Concrete	361.50	360.90	369.74	365.38	2.99	3.23	0.086	18.91	0.79	4.20	7.60	361.85	3.89	4.28
EX DMH-658	EX CB-653	EX DMH-651	19	15	Concrete	361.60	360.40	365.37	365.38	2.52	3.73	0.062	16.11	0.92	5.70	7.11	361.98	3.39	4.77
EX DMH-658	EX DMH-651	EX DMH-654	78	12	Concrete	360.00	354.50	365.38	360.11	4.38	4.61	0.071	9.47	1.88	19.80	9.19	360.58	4.80	5.31
EX DMH-658	EX DMH-654	EX DMH-655	86	12	Cast Iron	353.70	347.10	360.11	353.64	5.41	5.54	0.077	10.70	1.87	17.50	10.24	354.28	5.83	5.75
EX DMH-658	EX CB-656	EX DMH-655	4	12	Concrete	349.00	348.40	353.35	353.64	3.35	4.24	0.150	13.80	0.90	6.60	9.92	349.40	3.95	5.02
EX DMH-658	EX CB-657	EX DMH-655	32	12	Concrete	352.60	348.40	355.23	353.64	1.63	4.24	0.130	12.87	0.76	5.90	8.97	352.96	2.27	5.08
EX DMH-658	EX DMH-658	EX DMH-658	73	12	Cast Iron	347.10	342.30	353.64	347.81	5.54	4.61	0.066	9.88	2.80	29.40	10.94	347.83	5.81	4.61
FES-3	DMH-187	EX DMH-629	61	15	Concrete	382.60	380.60	388.22	385.56	4.37	3.71	0.033	11.74	6.56	55.90	9.84	383.63	4.59	3.46
EX OUTFALL-51	EX DMH-613	EX DMH-612	10	12	Concrete	424.00	423.50	428.11	428.44	3.11	3.94	0.053	8.17	5.73	70.20	11.26	424.35	3.16	4.20
EX OUTFALL-52	EX CB-617	EX OUTFALL-52	89	12	Concrete	389.00	383.11	393.43	389.90	3.43	N/A	0.064	9.03	1.76	19.50	8.91	389.56	3.87	N/A
EX OUTFALL-50	EX DMH-604	EX DMH-602	62	12	Concrete	421.90	418.70	427.46	423.94	4.56	4.24	0.051	8.07	1.25	15.40	7.45	422.37	5.09	4.63
FES-6	CB-160	CC-6	3	12	Concrete	280.83	280.76	285.01	282.00	3.18	N/A	0.026	5.74	0.53	9.20	4.57	281.13	3.88	N/A
FES-6	CC-6	EX DMH-635	16	12	Concrete	280.60	278.80	282.00	284.70	N/A	4.90	0.111	11.88	0.53	4.50	7.62	280.90	N/A	5.70
FES-7	CC-7	EX DMH-666	6	12	Concrete	268.50	268.00	269.03	272.24	N/A	3.24	0.086	10.46	0.49	4.70	6.80	268.79	N/A	4.08
FES-7	EX DMH-666	EX DMH-641	19	12	Concrete	267.66	267.57	272.24	272.57	3.57	4.00	0.005	2.52	0.49	19.30	2.48	267.96	4.28	4.71
FES-5	EX CB-667	DMH CIT-212	5	12	Cast Iron	267.80	267.78	271.92	272.10	3.12	3.32	0.005	2.67	0.44	16.70	0.57	268.26	2.66	2.84
FES-1	DMH-102	FES-1	72	12	Concrete	434.40	433.00	438.51	435.25	3.11	N/A	0.019	4.97	4.82	96.90	7.22	435.31	3.20	N/A
EX OUTFALL-50	CB-1018	DMH-100	65	12	Concrete	418.00	415.50	422.39	420.42	3.39	3.92	0.038	6.99	4.29	61.40	9.35	418.87	3.52	4.35
FES-1	GI-103	CB-101	5	12	Concrete	436.44	434.75	438.44	438.51	1.00	2.76	0.324	20.28	0.34	1.70	9.67	436.67	1.77	2.67
FES-1	CB-101	DMH-104	3	12	Concrete	439.15	438.90	443.61	444.03	3.46	4.13	0.093	10.84	0.96	8.90	8.53	439.56	4.05	4.64
FES-1	DMH-346	EX DMH-606	15	12	Concrete	435.00	433.80	441.16	440.19	5.16	5.39	0.082	10.21	1.92	18.40	9.19	437.32	3.84	3.05
FES-1	DMH CIT-105	DMH-104	84	12	Cast Iron	439.30	438.90	445.06	444.03	4.16	4.13	0.012	3.88	0.62	15.90	3.62	440.23	4.83	4.62
FES-1	CB-106	DMH CIT-105	18	12	Concrete	441.19	440.00	445.19	445.06	3.00	4.06	0.065	9.08	0.56	6.20	6.26	441.49	3.70	4.90
HW-3	CB-111	DMH-112	32	12	Concrete	439.15	438.50	443.26	443.33	3.11	3.83	0.021	5.12	1.32	25.70	5.46	439.63	3.63	4.34
HW-3	DMH-112	DMH-126	15	12	Concrete	438.35	438.00	443.33	442.95	3.98	3.95	0.024	5.48	1.69	30.80	6.15	438.90	4.43	4.55
HW-3	DMH-291	DMH-113	137	12	Concrete	435.75	433.20	440.73	438.20	3.98	4.00	0.019	4.86	2.68	55.20	6.34	436.45	4.28	4.03
HW-3	DMH-326	DMH-291	98	12	Concrete	437.90	435.85	442.95	440.73	4.05	3.88	0.021	5.17	1.86	36.10	6.05	438.48	4.47	4.18
HW-3	CB-114	DMH-113	11	12	Concrete	433.50	433.20	438.11	438.20	3.61	4.00	0.028	5.97	0.92	15.40	5.51	434.15	3.96	4.03
HW-3	CB-115	DMH-113	25	12	Concrete	434.35	433.20	438.36	438.20	3.01	4.00	0.046	7.63	0.67	8.80	5.98	434.69	3.67	4.18
HW-3	DMH-113	DMH-293	123	12	Concrete	433.10	430.90	438.20	435.92	4.10	4.02	0.018	4.76	4.13	86.80	6.83	433.96	4.24	4.00
HW-3	DMH-293	DMH-116	123	12	Concrete	430.80	428.50	435.92	433.67	3.87	3.92	0.019	8.85	5.31	60.00	7.54	431.73	4.19	3.40
HW-3	CB-117	DMH-116	7	12	Concrete	429.46	429.00	433.46	433.67	3.00	3.67	0.068	9.27	0.75	8.10	0.96	430.55	2.91	3.12
HW-3	CB-118	DMH-116	26	12	Concrete	429.85	428.65	433.35	433.67	3.00	4.02	0.047	7.73	0.47	6.10	5.45	430.14	3.71	3.51
HW-3	DMH-116	DMH-128	48	12	Concrete	428.40	427.80	433.67	432.73	4.02	3.68	0.013	7.23	6.34	87.70	5.17	430.11	3.56	3.08
HW-3	DMH-296	DMH-330	40	15	Concrete	426.30	425.70	430.61	429.86	3.06	2.91	0.015	7.94	7.63	96.10	6.22	428.16	2.45	2.25
HW-3	DMH-330	DMH-119	60	15	Concrete	425.60	424.85	429.86	429.18	3.01	3.08	0.013	7.22	7.62	105.90	6.21	427.48	2.38	2.53
HW-3	DMH-328	DMH-296	115	15	Concrete	427.70	426.40	432.73	430.61	3.78	2.96	0.011	6.86	6.47	94.30	5.28	429.35	3.18	2.21
HW-3	CB-120	DMH-119	5	12	Concrete	424.96	424.85	428.96	429.18	3.00	3.33	0.023	5.39	0.66	12.30	0.84	426.44	2.52	2.74
HW-3	CB-121	DMH-119	26	12	Concrete	425.35	425.00	429.36	429.18	3.01	3.18	0.013	4.10	0.45	11.00	0.57	426.43	2.93	2.75
HW-3	DMH-119	DMH-121	45	12	Concrete	424.75	424.15	429.18	429.02	3.18	3.62	0.013	7.44	8.51	114.30	6.93	426.39	2.79	3.41
HW-3	DMH-321	DMH-122	19	18	Concrete	423.90	423.50	429.02	429.07	3.62	4.07	0.021	15.36	9.99	65.00	5.65	425.48	3.54	3.76
HW-3	CB-123	DMH-122	5	12	Concrete	424.30	423.90	428.84	429.07	3.54	4.17	0.082	10.18	0.81	7.90	7.73	425.18	3.66	3.89
HW-3	CB-124	DMH-122	26	12	Concrete	425.23	424.50	429.23	429.07	3.00	3.57	0.028	5.92	0.64	10.70	4.93	425.71	3.52	3.33
HW-3	DMH-324	HW-3	29	18	Concrete	423.13	422.80	429.10	424.60	4.48	N/A	0.011	11.25	11.19	99.50	7.26	424.60	4.50	N/A
HW-1	DMH-127	DMH-133	17	18	Concrete	424.90	424.10	429.94	429.46	3.54	3.86	0.047	22.72	7.46	32.90	11.52	425.96	3.98	4.66
HW-1	DMH-133	HW-1	52	18	Concrete	424.00	422.80	429.46	424.60	3.96	N/A	0.023	15.94	7.71	48.30	8.95	425.08	4.38	N/A
HW-1	CB-128	DMH-127	8	12	Concrete	425.84	425.50	429.84	429.94	3.00	3.44	0.041	7.25	1.20	16.60	6.83	426.30	3.54	3.65
HW-1	CB-129	DMH-127	27	12	Concrete	426.23	425.00	430.23	429.94	3.00	3.94	0.045	7.59	0.40	5.20	5.11	426.49	3.74	3.85
HW-1	CB-132	DMH-130	26	12	Concrete	429.51	428.60	434.01	433.59	3.50	3.99	0.035	6.63	0.19	2.80	3.69	429.69	4.32	4.52
HW-1	DMH-130	DMH-127	142	18	Concrete	428.10	425.00	433.59	429.94	3.99	3.44	0.022	15.53	6.16	39.70	8.28	429.06	4.53	3.79
HW-3	CB-131	DMH-130	6	12	Concrete	429.95	429.30	433.52	433.59	2.97	3.29	0.040	7.15	1.81	25.40	7.60	430.12	3.40	3.88
HW-1	DMH CIT-133	DMH-338	19	15	Concrete	435.50	434.80	440.52	439.71	3.77	3.66	0.037	12.37	2.52	20.40	7.91	436.14	4.38	4.08
HW-1	DMH-338	DMH-130	195	15	Concrete	434.70	428.35	439.71	433.59	3.76	3.99	0.033	11.65	4.45	38.20	8.86	435.56	4.15	4.70
HW-1	CB-134	DMH CIT-133	8	12	Concrete	436.46	436.30	440.46	440.52	3.00	3.22	0.021	5.17	1.71	33.00	5.90	437.02	3.44	3.78
HW-1	CB-139	DMH CIT-138	5	12	Concrete	441.45	441.40	445.34	445.93	2.89	3.53	0.011	3.67	0.31	14.00	3.30	441.87	3.47	4.05
HW-1	CB-141	DMH-140	32	12	Concrete	442.80	442.60	447.49	446.56	3.69	2.95	0.006	2.82	0.27	9.70	2.28	443.02	4.47	3.73
HW-1	CB-143	DMH-142	22	12	Concrete	443.20	442.85	447.60	446.84	3.40	2.99	0.016	4.55	0.08	1.70	2.18	443.31	4.29	3.87
HW-1	DMH-142	DMH-140	21	12	Concrete	442.75	442.60	446.84	446.56	3.09	2.95	0.007	2.98	0.28	9.40	2.39	442.97	3.87	3.73
HW-1	CB-144	DMH-142	25	12	Concrete	443.05	442.85	447.42	446.84	3.37	2.99	0.008	3.19	0.21	6.50	2.29	443.24	4.18	3.82
EX OUTFALL-51	CB-145	EX DMH-608	46	12	Concrete	439.45	436.70	443.47	442.57	3.02	4.87	0.060	8.72	1.48	16.90	8.28	439.96	3.51	5.59
EX OUTFALL-51	CB-147	DMH-146	2	12	Concrete	434.14	434.00	438.11	438.21	2.97	3.21	0.061	8.79	0.62	7.10	6.46	434.55	3.56	3.62
EX OUTFALL-51	CB-148	EX DMH-610	31	12	Concrete	433.35	432.80	437.36	437.58	3.01	3.78	0.018	4.78	0.43	9.00	3.76	433.62	3.74	4.04
EX OUTFALL-51	CB-150	DMH-149	28	12	Concrete	430.60	429.75	434.02	435.06	3.02	4.31	0.031	6.24	0.63	10.00	5.09	430.91	3.69	4.42
EX OUTFALL-52	EX DMH-612	DMH-157	157	15	Concrete	422.00	414.50	428.44	420.00	5.19	4.25	0.048	14.11	10.31	73.00	12.55	423.19	5.25	4.30
EX OUTFALL-51	CB-158	DMH-157	10	12	Concrete	415.85	415.00	419.86	420.00	3.01	4.00	0.089	10.66	0.53	5.00	7.06	416.46	3.40	3.53
EX OUTFALL-52	CB-159	DMH CIT-160	89	12	Concrete	420.00	415.30	425.00	421.10	4.00	4.80	0.053	8.20	0.40	4.90	5.41	420.26	4.74	5.65
EX OUTFALL-51	DMH-157	EX DMH-619	97	15	Concrete	414.30	409.50	420.00	414.57	4.44	3.82	0.049	14.34	10.68	74.50	12.80	415.50	4.50	3.56
EX OUTFALL-51	GI-163	DMH CIT-164	31	12	Concrete	410.34	410.00	412.34	414.36	1.00	3.36	0.011	3.76	1.05	27.80	4.09	410.77	1.57	3.62
EX OUTFALL-51	EX DMH-619	DMH-165	88	15	Concrete	409.40	404.70	414.57	409.84	3.92	3.89	0.053	14.99	11.20	75.00	13.35	410.61	3.96	3.57
EX OUTFALL-51	CB-166	DMH-165	17	12	Concrete	405.70	404.85	409.74	409.84	3.04	3.99	0.051	8.04	0.67	8.40	6.22	406.04	3.70	3.97
EX OUTFALL-51	DMH-165	DMH-168	109	15	Concrete	404.60

HNTB	The HNTB Companies Engineers Architects Planners	MADE BY	DCS		3/9/2023											JOB NO.	608491				
		CHECKED BY	WJS		3/14/2023											PAGE NO.					
FOR	ROUTE 16 MINOOKEN	BACKCHECKED BY	DCS		3/14/2023																
										Conduit Analysis											
Network Outfall	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Material	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Slope (Calculated) (ft/ft)	Capacity (Design) (cfs)	Flow (cfs)	Flow / Capacity (Design) (%)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Depth to HGL (ft) In	Depth to HGL (ft) Out		
EX OUTFALL-51	CB-177	DMH-175	6	12	Concrete	390.31	390.20	394.73	394.72	3.42	3.52	0.0187	4.71	0.40	8.60	3.66	390.57	4.16	4.30		
EX OUTFALL-51	CB-176	DMH-175	10	12	Concrete	390.48	390.20	394.65	394.72	3.17	3.52	0.029	6.08	0.11	1.80	2.96	390.61	4.04	4.30		
EX OUTFALL-51	CB-180	DMH-178	10	12	Concrete	390.41	390.00	394.43	395.02	3.02	4.01	0.042	7.29	0.51	6.90	5.33	390.71	3.72	4.30		
EX OUTFALL-51	CB-179	DMH-178	17	12	Concrete	390.48	390.00	394.50	395.02	3.02	4.01	0.028	6.00	0.22	3.70	3.64	390.67	3.83	4.32		
EX OUTFALL-51	DMH-181	DMH-309	65	12	Concrete	391.15	390.60	395.91	395.46	3.76	3.85	0.009	3.28	2.96	90.20	4.74	391.89	4.02	4.08		
EX OUTFALL-51	DMH-309	DMH-178	63	12	Concrete	390.50	389.90	395.46	395.02	3.95	4.12	0.010	3.49	3.14	90.00	5.03	391.26	4.20	4.31		
EX OUTFALL-51	CB-181	DMH-181	19	12	Concrete	391.92	391.12	396.91	396.46	3.44	3.59	0.032	6.33	0.32	5.00	4.21	392.15	4.21	3.86		
EX OUTFALL-51	CB-182	DMH-181	5	12	Concrete	391.88	391.50	395.88	395.91	3.00	3.41	0.076	9.82	0.52	5.30	6.63	392.18	3.70	3.93		
EX OUTFALL-51	DMH-183	DMH-181	93	12	Concrete	392.20	391.25	397.20	395.91	4.00	3.66	0.010	3.61	2.52	69.70	4.97	392.88	4.32	3.85		
EX OUTFALL-51	CB-184	DMH-183	26	12	Concrete	393.83	392.75	397.83	397.20	3.00	3.45	0.042	7.27	0.27	3.70	4.42	394.04	3.79	4.15		
EX OUTFALL-51	CB-185	DMH-347	35	12	Concrete	393.95	392.60	397.95	397.53	3.00	3.93	0.038	6.98	0.25	3.60	4.20	394.16	3.79	4.27		
EX OUTFALL-51	DMH-347	DMH-183	21	12	Concrete	392.50	392.30	397.53	397.20	4.03	3.90	0.009	3.45	2.36	68.30	4.73	393.16	4.37	4.24		
FES-3	CB-186	DMH-187	39	12	Concrete	385.92	383.00	389.92	388.22	3.00	4.22	0.074	9.70	1.18	12.10	8.36	386.38	3.54	4.50		
FES-3	CB-190	DMH-193	24	12	Concrete	386.33	385.70	390.32	390.25	2.99	3.55	0.026	5.72	0.62	10.90	4.78	386.66	3.66	3.76		
FES-3	CB-195	DMH-343	6	12	Concrete	374.99	374.85	378.99	378.42	3.00	2.57	0.025	5.68	0.83	14.70	5.17	375.77	3.22	2.65		
FES-3	DMH-343	DMH CIT-196	27	12	Concrete	374.75	373.40	378.42	376.70	2.67	2.30	0.051	8.04	3.71	46.20	10.04	375.57	2.85	2.79		
FES-3	EX DMH-630	DMH-197	129	15	Concrete	371.00	361.46	376.73	366.85	4.48	4.14	0.074	17.58	14.71	83.70	16.04	372.23	4.50	3.47		
FES-3	CB-198	DMH-197	27	12	Concrete	362.97	361.70	366.97	366.85	3.00	4.15	0.047	7.74	1.35	14.90	7.08	363.42	3.55	3.91		
FES-3	CB-199	DMH-197	5	12	Concrete	363.26	362.90	367.26	366.85	3.00	2.95	0.077	9.86	0.33	3.30	0.42	364.36	2.90	2.49		
FES-3	DMH-197	DMH-200	130	15	Concrete	361.46	351.85	366.85	357.11	4.14	4.01	0.074	17.57	15.68	89.20	16.18	362.70	4.15	3.53		
FES-3	CB-201	DMH-200	28	12	Concrete	352.81	352.10	356.81	357.11	3.00	4.01	0.026	5.70	0.72	12.70	4.97	353.16	3.65	3.94		
FES-3	CB-202	DMH-200	3	12	Concrete	353.60	353.50	357.31	357.11	2.71	2.61	0.040	7.13	0.42	5.90	0.54	354.96	2.35	2.15		
FES-3	DMH-200	DMH-203	137	15	Concrete	351.85	341.70	357.11	346.84	4.01	3.89	0.074	17.57	16.41	93.40	16.27	353.09	4.02	3.18		
FES-3	CB-204	DMH-203	27	12	Concrete	342.90	341.85	346.91	346.84	3.01	3.99	0.038	6.97	0.99	8.50	5.42	343.22	3.69	3.82		
FES-3	CB-207	DMH-206	26	12	Concrete	336.33	335.50	340.33	340.14	2.99	3.64	0.032	6.39	0.41	6.50	4.58	336.60	3.72	4.47		
FES-3	CB-208	DMH-206	3	12	Concrete	336.59	336.40	340.59	340.14	3.00	2.74	0.059	8.68	0.35	4.00	5.40	336.83	3.76	3.58		
FES-3	DMH-206	DMH-209	126	18	Concrete	332.50	326.25	340.14	330.69	6.14	2.94	0.050	23.41	17.58	75.10	14.54	333.95	6.19	3.47		
FES-3	CB-211	DMH-209	4	12	Concrete	327.00	326.80	331.01	330.69	3.01	2.89	0.051	8.07	0.45	5.50	5.51	327.28	3.73	3.71		
FES-3	CB-210	DMH-209	19	12	Concrete	326.91	326.00	330.91	330.69	3.00	3.69	0.049	7.88	0.45	5.80	5.45	327.19	3.72	4.12		
FES-3	DMH-209	DMH-356	77	18	Concrete	323.75	320.25	330.69	324.88	5.44	3.13	0.045	22.35	18.12	81.10	14.09	325.20	5.49	3.57		
FES-3	DMH-356	DMH-212	43	18	Concrete	318.25	316.40	324.88	321.60	5.13	3.70	0.043	21.71	18.25	84.10	13.77	319.70	5.18	4.06		
FES-3	DMH-212	EX DMH-631	146	18	Concrete	314.40	306.90	321.60	311.68	5.70	3.28	0.051	23.80	18.53	77.80	14.88	315.86	5.74	3.78		
FES-3	CB-213	EX DMH-631	32	12	Concrete	306.85	306.40	310.94	311.68	3.09	4.28	0.014	4.20	0.82	19.60	4.15	307.23	3.71	4.98		
FES-3	DMH-215	FES-3	9	24	Concrete	291.10	291.00	299.28	293.33	6.18	N/A	0.011	23.33	19.64	84.20	8.32	292.69	6.59	N/A		
FES-3	GI-216	DMH-374	10	12	Concrete	292.90	292.50	294.90	296.32	1.00	2.82	0.040	7.13	0.77	10.80	5.93	293.27	1.63	3.02		
FES-3	DMH-374	DMH-215	45	12	Concrete	292.50	292.10	296.32	299.28	2.82	6.18	0.009	3.38	0.77	22.70	3.48	293.30	3.02	6.00		
FES-6	CB-220	EX DMH-636	3	12	Concrete	271.75	271.50	276.30	276.10	3.61	3.80	0.094	10.93	0.35	3.20	6.34	271.99	4.37	4.41		
FES-6	CC-4	FES-6	12	12	Concrete	270.20	269.71	272.04	271.01	N/A	N/A	0.041	7.20	2.38	33.00	8.22	270.86	N/A	N/A		
FES-7	CB-221	DMH-222	17	12	Concrete	270.20	270.10	273.93	274.13	2.70	3.03	0.006	2.76	0.32	11.60	2.34	270.43	3.47	3.80		
FES-7	DMH-222	DMH-315	35	12	Concrete	270.00	269.54	274.13	273.44	3.13	2.90	0.013	4.11	0.32	7.70	3.11	270.23	3.90	3.71		
FES-7	DMH-315	DMH CIT-223	45	12	Concrete	269.44	269.20	273.44	272.82	3.00	2.62	0.005	2.59	0.51	19.90	2.57	269.74	3.70	3.26		
FES-7	GI-224	DMH CIT-223	8	12	Concrete	270.34	269.30	272.34	272.82	1.00	2.52	0.135	13.31	0.17	1.30	5.80	270.51	1.83	3.20		
FES-7	CB-229	DMH CIT-228	7	12	Concrete	268.10	268.00	272.00	272.51	2.90	3.51	0.014	4.14	0.17	4.10	2.59	268.27	3.73	4.30		
FES-7	CB-230	DMH CIT-228	25	12	Concrete	268.10	267.90	271.93	272.51	2.83	3.61	0.008	3.21	0.31	9.80	2.60	268.33	3.60	4.30		
FES-7	EX DMH-641	FES-7	26	12	Concrete	266.87	266.50	272.57	267.75	4.70	N/A	0.014	4.23	1.60	37.90	5.02	267.44	5.13	N/A		
FES-6	DMH-227	FES-6	23	12	Concrete	262.50	262.00	269.65	263.75	6.15	N/A	0.022	5.26	2.03	38.60	6.27	263.11	6.54	N/A		
FES-5	DMH CIT-232	EX DMH-643	37	18	Concrete	267.70	267.30	272.10	272.49	2.90	3.69	0.011	11.00	10.14	92.20	5.74	269.24	2.86	3.59		
FES-5	EX DMH-643	FES-5	20	18	Concrete	267.20	266.70	272.49	268.49	3.79	N/A	0.025	16.44	10.94	66.60	9.96	268.47	4.02	N/A		
FES-5	CB-234	DMH CIT-233	11	12	Concrete	268.80	268.00	272.00	272.60	2.90	3.60	0.009	3.46	0.28	8.20	2.66	268.59	3.41	4.05		
FES-5	CB-236	DMH-235	11	12	Concrete	268.80	268.65	272.46	272.91	2.66	3.26	0.014	4.18	0.44	10.40	3.44	269.07	3.39	4.04		
FES-5	DMH-235	DMH CIT-233	39	12	Concrete	268.55	268.10	272.91	272.60	3.36	3.50	0.012	3.82	0.43	11.40	3.23	268.82	4.09	4.02		
FES-5	DMH-237	DMH-317	138	15	Concrete	274.50	269.75	274.93	274.13	4.14	3.93	0.034	11.97	9.49	79.30	10.82	275.67	4.22	3.62		
FES-5	DMH-317	DMH CIT-232	176	18	Concrete	269.65	267.80	274.93	272.10	3.78	2.80	0.010	10.76	10.13	94.10	5.73	271.20	3.73	2.53		
FES-5	CB-239	DMH-237	13	12	Concrete	275.75	275.00	279.77	279.89	3.02	3.89	0.058	8.66	5.60	64.70	5.93	276.04	3.71	4.39		
FES-5	CB-243	DMH-242	15	12	Concrete	282.00	281.00	286.00	285.69	3.00	3.69	0.068	9.26	0.90	9.40	6.30	282.29	3.71	3.69		
FES-5	DMH-242	DMH-237	117	15	Concrete	280.20	274.60	285.69	279.89	4.24	4.04	0.048	14.14	8.75	61.90	12.13	281.35	4.34	3.96		
FES-5	DMH-244	DMH-242	144	12	Concrete	287.70	280.50	292.93	285.69	4.23	4.19	0.050	7.96	7.96	100.10	10.14	288.79	4.34	4.33		
FES-5	CB-246	DMH-244	13	12	Concrete	288.85	287.90	292.84	292.93	2.99	4.03	0.075	9.74	0.54	5.60	6.68	289.16	3.68	4.06		
FES-5	DMH-269	DMH-267	169	12	Concrete	346.40	337.70	351.06	342.72	3.66	4.02	0.052	8.09	1.43	17.70	7.77	346.91	4.15	4.50		
FES-5	DMH-267	DMH-265	76	12	Concrete	337.60	333.80	342.72	338.88	4.12	4.08	0.050	7.96	1.88	23.60	8.19	338.18	4.54	4.41		
FES-5	DMH-265	DMH-255	56	12	Concrete	333.70	330.95	338.88	335.98	4.18	4.03	0.049	7.89	2.63	33.40	9.03	334.40	4.48	4.33		
FES-5	DMH-255	DMH-262	105	12	Concrete	330.85	325.70	335.98	330.67	4.13	3.97	0.049	7.88	2.99	37.90	9.14	331.59	4.39	4.06		
FES-5	DMH-262	DMH-257	159	12	Concrete	327.60	317.70	330.67	322.75	4.07	4.05	0.050	7.95	3.86	48.50	10.05	328.43	4.24	4.02		
FES-5	DMH-257	DMH-254	163	12	Concrete	317.60	309.60	322.75	314.59	4.15	3.99	0.049	7.88	4.76	60.40	10.51	318.50	4.25	3.84		
FES-5	DMH-254	DMH-251	146	12	Concrete	309.50	302.15	314.59	307.28	4.09	4.13	0.050	8.00	5.63	70.30	11.03	310.44	4.15	3.88		
FES-5	DMH-251	DMH-249	131	12	Concrete	302.05	295.70	307.28	300.68	4.23	3.98	0.049	7.85	6.40	81.50	11.14	303.05	4.27	3.65		
FES-5	DMH-249	DMH-244	155	12	Concrete	295.60	287.80	300.68	292.93	4.08	4.13	0.050	7.99	7.09	88.80	11.49	296.58	4.10	3.53		
FES-5	CB-250	DMH-249	14	12	Concrete	296.90	295.80	300.91	300.68	3.01	3.88	0.077	9.92	0.48	4.80	6.51	297.19	3.72	3.88		
FES-5	CB-253	DMH-251	13	12	Concrete	303.30	302.15	307.37	307.28	3.07	4.13	0.089	10.64	0.54	5.10	7.11	303.61	3.76	4.14		
FES-5	CB-256	DMH-254	14	12	Concrete	310.86	310.00	314.86	314.59	3.00	3.59	0.060	8.71	0.57	6.60	6.27	311.17	3.69	3.97		
FES-5	CB-259	DMH-257	13	12	Concrete	318.82	318.00	322.82	322.75	3.00	3.75	0.063	8.91	0.61	6.90	6.50	319.15	3.67	4.17		
FES-5	CB-258	DMH-257	5	12	Concrete	318.75	318.40	322.75	322.75	3.00	3.35	0.069	9.33	0.42	4.50	5.99	319.02	3.73	3.74		
FES-5	CB-261	DMH-262	6	12	Concrete	326.50	326.00	330.57	330.67	3.07	3.67	0.088	10.55	0.28	2.70	5.81	326.72	3.85	4.19		
FES-5	CB-263	DMH-255	7	12	Concrete	331.95	331.50	335.95	335.98	3.00	3.48	0.066	9.16	0.39	4.20	5.79	332.21	3.74	4.15		
FES-5	CB-264	DMH-262	15	12	Concrete	326.52	326.00	330.96	330.67	3.04	3.67	0.063	8.91	0.67	7.50	6.66	327.26	3.70	4.12		
FES-5	CB-266	DMH-265	16	12	Concrete	335.15	334.00	339.14	338.88	2.99	3.88	0.074	9.70	0.80	8.20	7.46	335.52	3.62	4.41		
FES-5	CB-268	DMH-267	5	12	Concrete	338.60	338.30	342.61	342.72	3.01	3.42	0.063	8.91	0.49	5.50	6.08	338.89	3.72	4.24		
FES-5	CB-270	DMH-269	7	12	Concrete	347.13	346.60	351.13	351.06	3.00	3.46	0.073	9.60	0.70	7.30	7.13	347.48	3.65	4.30		
FES-5	CB-271	DMH-269	16	12	Concrete	347.33	346.50	351.33	351.06	3.00	3.56	0.053	8.22	0.73	8.90	6.46	347.69	3.64	4.30		
EX HW-646	CB-273	DMH-272	32	12	Concrete	359.64	353.55	359.64	359.69	3.00	5.14	0.066	9.12	0.37	4.10	5.69	355.89	3.75	5.67		
EX HW-646	DMH-272	DMH-132	13	15	Concrete	353.30	352.30	359.69	359.07	5.34	5.52	0.061	15.96	1.99	25.00	10.82	353.91	5.78	5.15		
EX HW-646	CB-275	DMH-274	3	12	Concrete	357.30	357.00	361.77	362.18	3.67	4.18	0.100	6.20	0.72	11.70	5.28	357.46	4.31	4.95		
EX HW-646	DMH-277	EX DMH-647	176	15	Concrete	367.10	359.00	373.01	364.79	4.66	4.54	0.046	13.86	3.15	22.70	9.13	367.81	5.20	5.38		
EX HW-646	CB-278	DMH-277	4	12	Concrete	369.12	368.80	373.12	373.01	3.00	3.21	0.091	10.77	0.60	5.60	7.37	369.44	3.68	4.05		
EX HW-646	DMH-279	DMH-277	61	15	Concrete	367.90	367.20	375.31	373.01	6.16	4.56	0.011	6.92	2.69	38.80	5.29	368.56	6.75	5.12		
EX HW-646	CB-280	DMH-279	29	12	Concrete	371.72	369.00	375.72	375.31	3.00	5.31	0.093	10.89	0.44	4.00	6.78	371.99	3.73	6.17		
EX HW-646	CB-281	EX DMH-648	6	12	Concrete	372.90	372.80	377.43	377.78	3.53	3.98	0.018	4.72	0.58	12.40	4.09	373.22	4.21	4.78		
EX HW-646	CB-284	DMH-283	19	12	Concrete	374.20	373.10	378.20	378.39	3.00	4.28	0.057	8.53	0.75	8.80	6.70	374.56	3.64	4.89		
EX HW-646	DMH-283	DMH-282	132	12	Concrete	373.00	371.62	378.39	377.47	4.38	4.85	0.010	3.65	1.12	30.80	4.09	373.45	4.94	5.47		
EX HW-646	CB-285	DMH-283	45	12	Concrete	374.50	373.10	378.51	378.39	3.01	4.28	0.031	6.30	0.38	6.00	4.43	374.76	3.75	4.90		
EX DMH-658	CB-286	DMH-287	17	12	Concrete	374.28	374.10	378.28	378.26	3.00	3.16	0.011	3.71	0.27	7.40	2.76	374.50	3.78	3.98		
EX DMH-658	DMH-287	DMH-288	98	12	Concrete	374.00	370.80	378.26	376.00	3.26	4.20	0.033	6.42	0.27	4.30	4.06	374.21	4.05	4.85		
EX DMH-658	CB-289	DMH-288	8	12	Concrete	372.04	371.50	375.99	376.00	2.95	3.50	0.070	9.43	0.48	5.00	6.27	372.33	3.66	4.34		
EX DMH-658	CB-290	DMH-288	13	12	Concrete	371.80	371.00	375.84	376.00	3.03	4.00	0.062	8.87	0.47	5.30	5.98	372.08	3.76	4.84		
EX DMH-658	DMH-288	EX DMH-651	234	12	Concrete	370.70	360.40	376.00	365.38	4.30	3.98	0.044	7.47	0.92	12.40	6.48	371.10	4.90	4.74		
FES-4	CB-231	DMH-227	80	24	PVC	262.30	262.10	267.40	269.65	2.92	5.15	0.000	0.29	2.03	690.30	0.65	263.31	4.11	6.38		
EX OUTFALL-51	GI-153	DMH-372	16	12	Concrete	424.50	424.30	426.50	428.13	1.00	3.03	0.013	4.05	0.75	18.50	3.93	425.08	1.42	3.24		
EX OUTFALL-52	CB-170	DMH-352	19	12	Concrete	401.50	401.35	405.98	404.79	3.48	2.44	0.008	3.14	0.39	12.40	2.72	401.76	4.22	3.09		
FES-3	DMH-193	DMH-191	50	12	Concrete	385.60	383.40	388.93	388.93	3.65	4.53	0.044	7.50	1.45	46.00	9.36	386.39	3.86	4.59		
FES-3	CB-189	DMH-337	6	12	Concrete	392.70	392.30	396.69	396.61	2.99	3.31	0.065	9.05	0.47	5.20	6.08	392.98	3.71	4.14		
HW-3	CB-292	DMH-291	28	12	Concrete	436.90	436.00	440.90	440.73	3.00	3.73	0.032	6.40	0.87	13.60	5.70	437.29	3.61	4.22		
HW-3	CB-294	DMH-293	6	12	Concrete	431.69	431.20	435.69	435.92	3.00	3.72	0.078	9.94	0.83	8.40	7.67	432.07	3.62	4.14		
HW-3	CB-295	DMH-293	27	12	Concrete	432.29	431.00	436.18	435.92	2.89	3.92	0.049	7.86	0.51	6.50	5.64	432.59	3.59	4.14		
HW-3	CB-297	DMH-296	5	12	Concrete	426.39	426.30	430.39	430.61	3.00	3.31	0.019	4.93	0.89	18.00	1.13	428.22	2.17	2.39		
HW-3	CB-298	DMH-296	27	12	Concrete	426.94	426.55	430.89	430.61	2.95	3.06	0.014	4.27	0.58	13.70	0.74	428.23	2.66	2.39		
EX OUTFALL-51	CB-299	DMH-300	4	12	Concrete	436.80	436.60	440.79	440.84	2.99	3.24	0.047	7.68	1.21	15.70	7.13	437.26	3.53	3.91		
EX OUTFALL-51	CB-301	EX DMH-610	5	12	Concrete	432.90	432.80	437.34	437.58	3.44	3.78	0.019	4.89	0.50	10.30	4.02	433.70	3.64	3.88		
EX OUTFALL-51	CB-302	DMH-302	55	12	Concrete	429.30	426.75	433.31	432.76	3.21	5.01	0.043	7.37	0.46	6.20	5.22	429.38	3.93	5.26		
EX OUTFALL-51	CB-303	DMH-304	27	12	Concrete	426.64	425.05	430.64	431.48	3.00	5.43	0.059	8.63	0.37	4.30	5.46	426.89	3.75	5.48		
EX OUTFALL-51	CB-308	DMH-323	23	12	Concrete	390.40	390.00	394.72	394.95	3.32	3.95	0.017	4.69	0.33	7.00	3.43	390.75	3.97	4.18		
EX OUTFALL-51	CB-305	DMH-306	20	12	Concrete	391.85	390.75	395.88	395.90	3.02	4.15	0.056	8.42	0.79	9.40	1.00	393.12	2.76	2.79		
EX OUTFALL-51	CB-310	DMH-309	10	12	Concrete	390.95	390.35	394.96	395.46	3.01	4.10	0.062	8.91	0.34	3.80	5.45	391.32	3.64	4.12		
FES-3	DMH CIT-188	DMH-187	23	15	Concrete	385.20	383.60	390.60	388.22	4.13	3.37	0.069	16.96	5.39	31.80	12.27	386.14	4.46	4.08		
FES-3	CB-311	DMH-193	32	12	Concrete	384.63	383.00	389.06	388.93	3.43	3.40	0.050	8.00	4.80	60.00	5.25	384.89	4.17	4.25		
FES-3	DMH-354	EX DMH-629	60	12	Concrete	382.90	380.70	387.40	385.56	3.50	3.86	0.037	6.81	0.60	8.90	5.35	383.22	4.18	3.63		
FES-6	CB-314	DMH-313	3	12	Concrete	275.50	275.45	280.08	279.97	3.58	3.52	0.019	4.85	0.41	8.40	3.75	275.76	4.32	4.30		
FES-7	CB-316	DMH-315	8	12	Concrete	269.50	269.45	272.98	273.44	2.48	2.99	0.006	2.80	0.20	7.10	2.08	269.76	3.22	3.98		
FES-5	CB-318	DMH-317	16	12	Concrete	271.10	270.40	275.11	274.93	3.01	3.53	0.043	7.36	0.46	6.10	5.19	271.59	3.52	3.33		
HW-3	CB-319	DMH-321	26	12	Concrete	425.19	424.40	429.19	429.02	3.00	3.62	0.030	6.16	0.82	13.30	5.45	425.57	3.62	3.51		
HW-3	CB-320	DMH-321	5	12	Concrete	424.40	424.40	428.80	429.02	3.20	3.62	0.041	7.20	0.97	13.50	6.39	425.52	3.28	3.50		
FES-8	EX CB-634	FES-8	46	15	Concrete	297.30	291.00	301.51	294.85	2.96	N/A	0.137	21.90	0.00	0.00	1.92	297.33	4.18	N/A		
EX OUTFALL-51	DMH-168	DMH-341	79	15	Concrete	398.10	395.35	403.27	399.54	3.92	2.94	0.035	12.08	11.94	98.80	9.73	399.99	3.28	2.24		
EX OUTFALL-51	DMH-341	DMH-175	41	15	Concrete	395.25	392.40	399.54	397.93	3.04	4.28	0.070	17.05	13.68	80.20	13.15	396.65	2.89	3.31		
EX OUTFALL-51	DMH-323	DMH-172	5	12	Concrete	389.90	389.50	394.95	395.05	4.05	4.55	0.080	10.08	0.51	5.00	6.71	390.76	4.19	4.29		
EX OUTFALL-51	CB-307	DMH-323	9	12	Concrete	390.75	390.00	395.11	394.95	3.36	3.95	0.087	10.52	0.18	1.80	5.10	390.93	4.18	4.19		
HW-3	DMH-122	DMH-324	4	18	Concrete	423.40	423.25	429.07	429.10	4.17	4.35	0.036	19.85	11.20	56.40	6.34	425.15	3.92	4.00		
HW-3	DI-329	DMH-330	50	12	Concrete	427.00	425.85	431.02	429.86	3.02	3.01	0.023	5.41	0.

HNTB	The HNTB Companies Engineers Architects Planners	MADE BY	DCS		3/9/2023										JOB NO.	608491				
		CHECKED BY	WJS		3/14/2023										PAGE NO.					
FOR	ROUTE 16 MENDON	BACKCHECKED BY	DCS		3/14/2023															

										Conduit Analysis										
Network Outfall	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Material	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Slope (Calculated) (ft/ft)	Capacity (Design) (cfs)	Flow (cfs)	Flow / Capacity (Design) (%)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Depth to HGL (ft) In	Depth to HGL (ft) Out
HW-3	CB-348	DMH-112	20	12	Concrete	440.10	419.00	444.01	443.33	2.91	3.33	0.0514	8.29	0.38	4.60	5.37	440.36	3.65	4.38
EX OUTFALL-51	CB-349	DMH-149	4	12	Concrete	431.15	431.05	435.14	435.06	2.99	3.01	0.0218	5.94	0.28	4.70	3.86	431.37	3.77	3.85
EX OUTFALL-51	CB-350	EX DMH-613	15	12	Concrete	425.29	424.50	429.31	428.11	3.02	2.61	0.052	8.15	0.79	9.70	6.58	425.66	3.65	3.02
FES-1	CB-351	DMH CIT-105	47	12	Concrete	443.76	440.00	447.76	445.06	3.00	4.06	0.079	10.04	0.11	1.10	4.25	443.90	3.86	4.82
EX OUTFALL-52	CB-162	DMH-352	4	12	Concrete	401.60	401.35	405.20	404.79	2.60	2.44	0.057	8.49	0.36	4.20	5.35	401.85	3.35	3.07
FES-3	CB-192	DMH-335	13	12	Concrete	379.71	378.70	383.73	384.12	3.00	4.42	0.078	9.95	1.65	16.60	9.38	380.28	3.45	4.39
FES-3	CB-353	DMH-354	30	12	Concrete	383.70	383.00	387.70	387.40	3.00	3.40	0.023	5.43	0.22	4.10	3.40	383.89	3.81	4.36
FES-3	CB-355	DMH-356	19	12	Concrete	321.33	320.50	325.13	324.88	2.80	3.38	0.045	7.55	0.25	3.30	4.41	321.53	3.60	3.90
EX OUTFALL-50	CB-358	DMH-100	36	12	Concrete	417.40	415.50	421.46	420.42	3.06	3.92	0.053	8.18	0.32	3.50	3.77	417.54	3.92	3.98
FES-3	CB-357	DMH-212	4	12	Concrete	317.31	317.02	321.98	321.60	3.67	4	3.58	0.081	10.16	0.45	4.40	6.49	317.59	4.39	4.42
FES-3	CB-359	DMH-215	40	12	Concrete	295.20	293.60	299.72	299.28	3.52	4.68	0.040	7.16	0.35	4.90	4.72	295.44	4.28	5.53
FES-6	CB-361	DMH-313	17	12	Concrete	275.50	275.10	280.01	279.97	3.51	3.87	0.023	5.43	0.28	5.20	3.65	275.72	4.29	4.37
FES-6	CB-362	EX DMH-637	18	12	Concrete	271.82	271.73	275.91	276.08	3.10	3.35	0.005	2.46	0.28	11.30	2.08	272.05	3.86	4.13
FES-5	CB-363	EX DMH-643	35	12	Concrete	268.00	267.30	271.84	272.49	2.84	4.19	0.020	5.06	0.37	7.30	3.76	268.68	3.16	3.81
FES-7	CB-364	CC-7	5	12	Concrete	268.60	268.50	271.92	269.03	2.32	N/A	0.022	5.31	0.49	9.20	4.22	268.89	3.03	N/A
FES-5	CB-365	DMH-317	5	12	Concrete	270.85	270.60	274.87	274.93	3.02	3.13	0.046	7.67	0.46	6.00	5.38	271.60	3.27	3.33
FES-5	CB-366	DMH-237	9	12	Concrete	275.70	275.00	279.73	279.89	3.03	3.89	0.076	9.83	0.48	4.90	6.49	275.99	3.74	4.12
FES-5	CB-367	DMH-242	12	12	Concrete	281.40	280.70	285.46	285.69	3.06	3.99	0.056	8.46	0.55	6.40	6.06	281.71	3.75	4.27
FES-5	CB-368	DMH-244	12	12	Concrete	288.92	288.00	292.91	292.93	2.99	3.93	0.077	9.91	0.55	5.60	6.79	289.23	3.68	4.00
FES-5	CB-369	DMH-249	12	12	Concrete	296.40	295.70	300.39	300.68	2.99	3.98	0.059	8.64	0.39	4.50	5.56	296.66	3.73	4.02
FES-5	CB-370	DMH-251	5	12	Concrete	308.11	307.70	312.12	307.28	3.01	3.58	0.080	10.10	0.39	3.90	6.21	308.95	3.17	3.33
FES-5	CB-371	DMH-254	6	12	Concrete	310.58	310.20	314.58	314.59	3.00	3.39	0.066	9.12	0.45	4.90	6.03	311.13	3.45	3.45
EX OUTFALL-51	DMH-372	EX DMH-613	8	12	Concrete	424.20	424.00	428.33	428.11	3.13	3.11	0.025	5.63	0.75	13.30	4.97	425.08	3.25	3.03
FES-3	EX DMH-631	DMH-215	154	18	Concrete	302.00	294.80	311.68	299.28	8.18	2.98	0.047	22.71	19.00	83.60	14.39	303.46	8.22	3.43

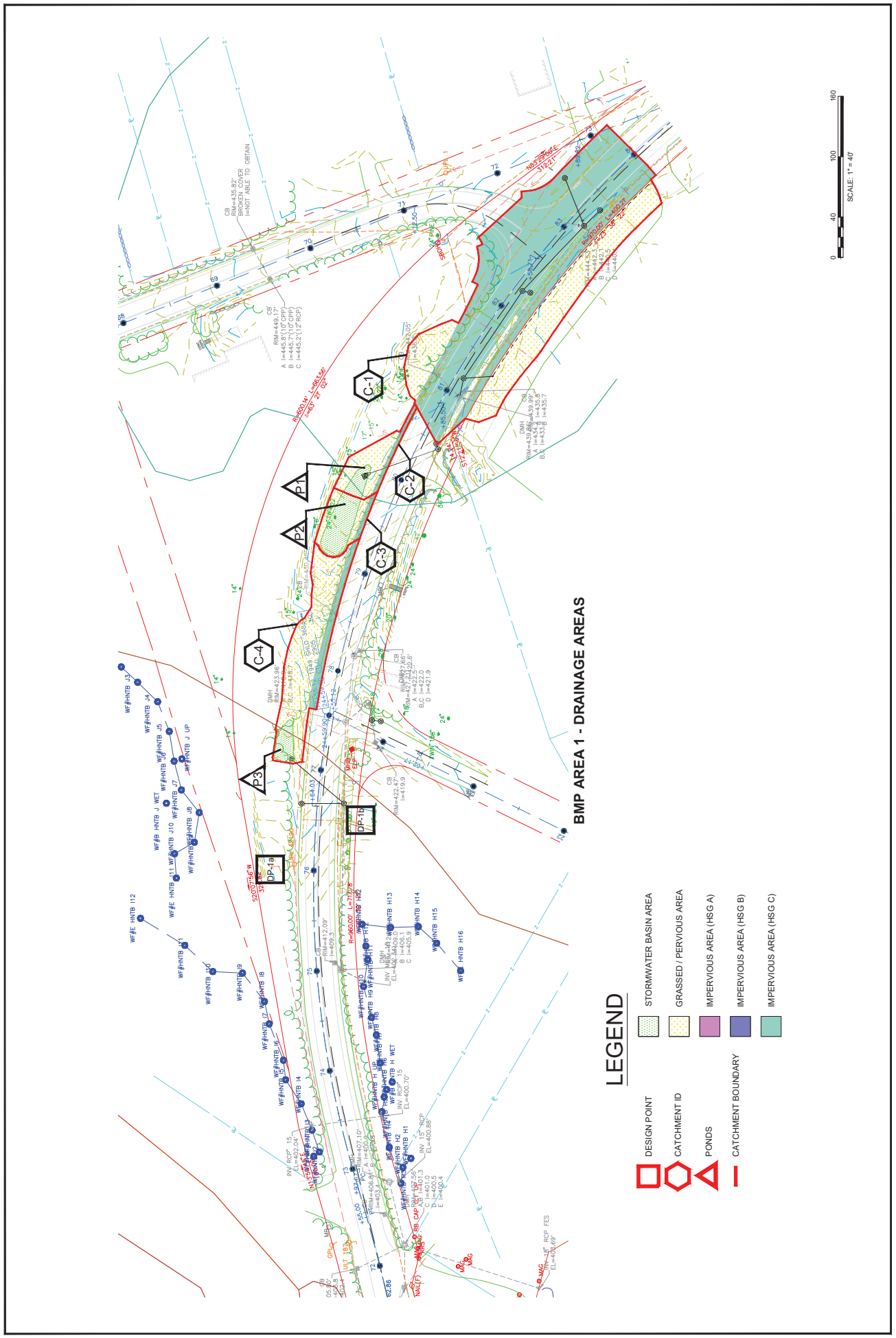
Manning's n of 0.013 used for all concrete pipe.
All instances of shallow cover will be resolved at next submission.

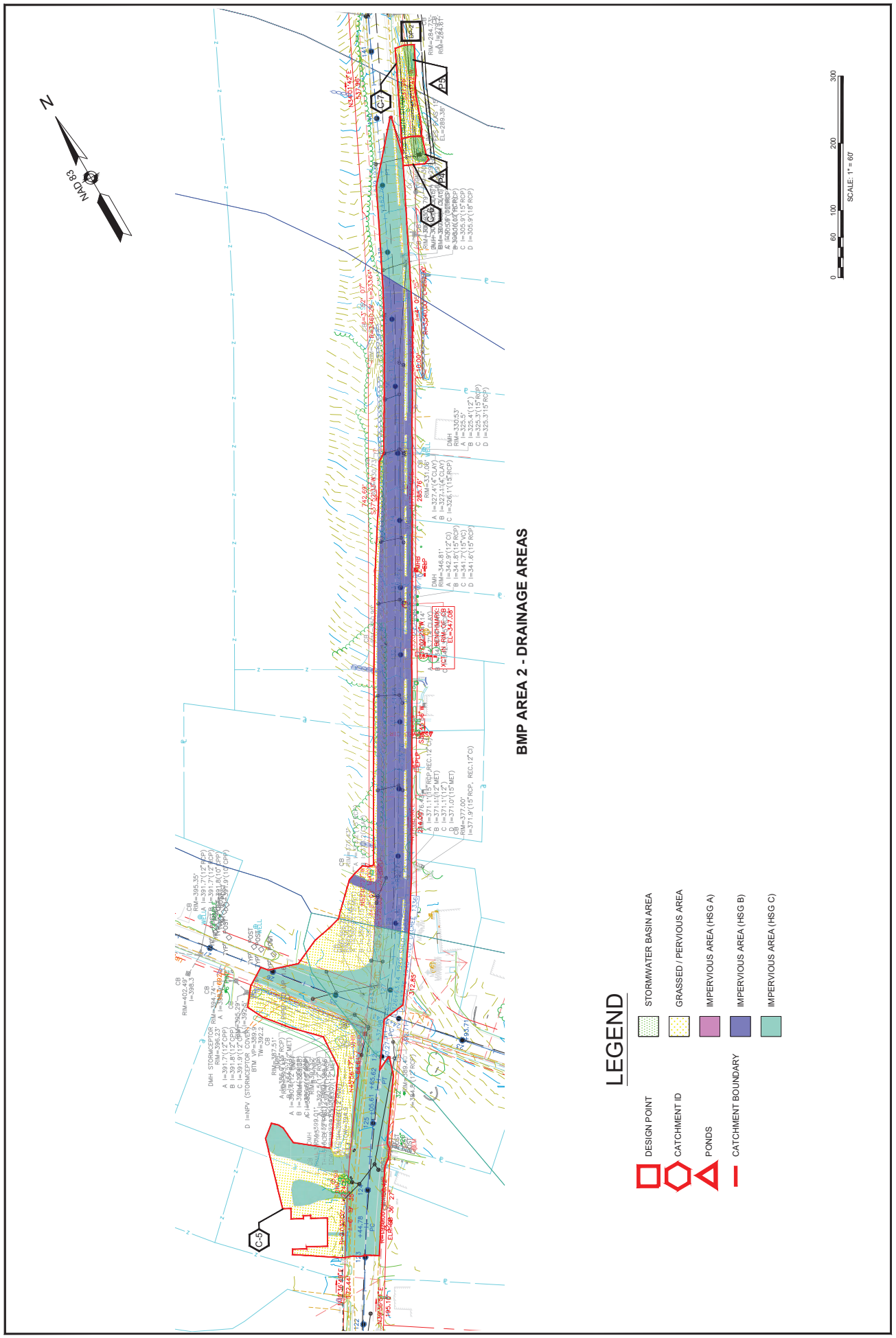
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Proposal No. 608491-131468

Appendix E

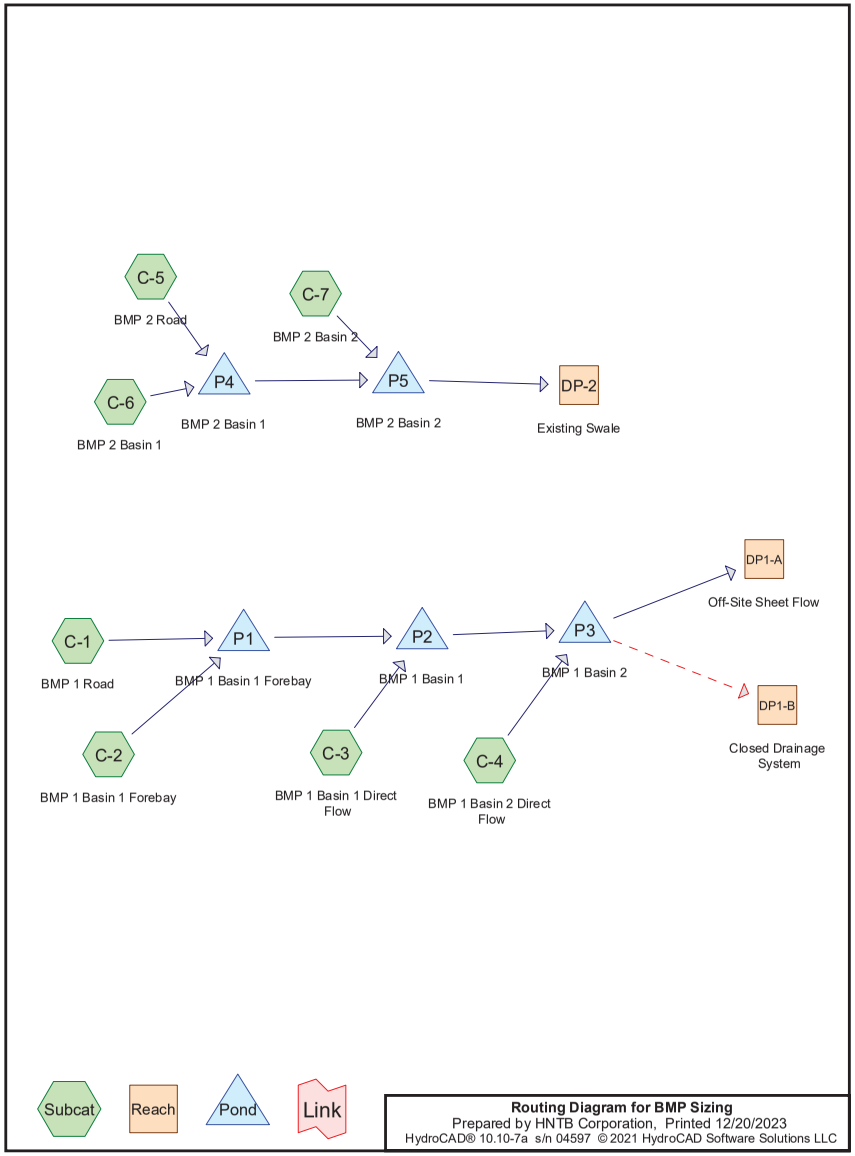
BMP Design Calculations
BMP Design HydroCAD
Recharge, Water Quality Volume, Drawdown Calculations
Grass Channel Calculations


BMP AREA 1 - DRAINAGE AREAS
LEGEND
STORMWATER BASIN AREA
GRASSED / PERVIOUS AREA
IMPERVIOUS AREA (HSG A)
IMPERVIOUS AREA (HSG B)
IMPERVIOUS AREA (HSG C)
DESIGN POINT
CATCHMENT ID
PONDS
CATCHMENT BOUNDARY
SCALE: 1" = 40'
0
40
100
160
C-1
C-2
C-3
C-4
P1
P2
P3
DP-1a
DP-1b


608491_UTBMP CATCHMENT AREAS.DWG Plotted on 2-Mar-2023 11:46 PM
N
NAD 83
BMP AREA 2 - DRAINAGE AREAS
LEGEND
DESIGN POINT
CATCHMENT ID
PONDS
CATCHMENT BOUNDARY
STORMWATER BASIN AREA
GRASSED / PERVIOUS AREA
IMPERVIOUS AREA (HSG A)
IMPERVIOUS AREA (HSG B)
IMPERVIOUS AREA (HSG C)
0
60
100
200
300
SCALE: 1" = 60'

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4244 MA Raynham Bristol County



Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.37	2
2	10-year	Type III 24-hr		Default	24.00	1	5.21	2
3	25-year	Type III 24-hr		Default	24.00	1	6.36	2
4	100-year	Type III 24-hr		Default	24.00	1	8.14	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.340	74	>75% Grass cover, Good, HSG C (C-1, C-2, C-3, C-4, C-5, C-6, C-7)
0.085	98	Stormwater Basin (C-2, C-3, C-4, C-6, C-7)
2.645	98	Unconnected pavement, HSG C (C-1, C-2, C-3, C-4, C-5)
4.070	**90**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.985	HSG C	C-1, C-2, C-3, C-4, C-5, C-6, C-7
0.000	HSG D	
0.085	Other	C-2, C-3, C-4, C-6, C-7
4.070		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.340	0.000	0.000	1.340	>75% Grass cover, Good	C-1, C-2, C-3, C-4, C-5, C-6, C-7
0.000	0.000	0.000	0.000	0.085	0.085	Stormwater Basin	C-2, C-3, C-4, C-6, C-7
0.000	0.000	2.645	0.000	0.000	2.645	Unconnected pavement	C-1, C-2, C-3, C-4, C-5
0.000	**0.000**	**3.985**	**0.000**	**0.085**	**4.070**	**TOTAL AREA**	

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment C-1: BMP 1 Road Runoff Area=32,025 sf 66.72% Impervious Runoff Depth>2.19"
Tc=5.0 min CN=90 Runoff=1.99 cfs 0.134 af

Subcatchment C-2: BMP 1 Basin 1 Forebay Runoff Area=2,423 sf 35.49% Impervious Runoff Depth>1.63"
Tc=5.0 min CN=83 Runoff=0.11 cfs 0.008 af

Subcatchment C-3: BMP 1 Basin 1 Direct Runoff Area=2,457 sf 68.46% Impervious Runoff Depth>2.19"
Tc=5.0 min CN=90 Runoff=0.15 cfs 0.010 af

Subcatchment C-4: BMP 1 Basin 2 Direct Runoff Area=7,272 sf 25.33% Impervious Runoff Depth>1.29"
Tc=5.0 min UI Adjusted CN=78 Runoff=0.27 cfs 0.018 af

Subcatchment C-5: BMP 2 Road Runoff Area=127,849 sf 71.94% Impervious Runoff Depth>2.28"
Tc=5.0 min CN=91 Runoff=8.21 cfs 0.558 af

Subcatchment C-6: BMP 2 Basin 1 Runoff Area=1,416 sf 44.00% Impervious Runoff Depth>1.78"
Tc=5.0 min CN=85 Runoff=0.07 cfs 0.005 af

Subcatchment C-7: BMP 2 Basin 2 Runoff Area=3,843 sf 14.60% Impervious Runoff Depth>1.29"
Tc=5.0 min CN=78 Runoff=0.14 cfs 0.009 af

Reach DP-2: Existing Swale Inflow=8.42 cfs 0.553 af
Outflow=8.42 cfs 0.553 af

Reach DP1-A: Off-Site Sheet Flow Inflow=0.14 cfs 0.001 af
Outflow=0.14 cfs 0.001 af

Reach DP1-B: Closed Drainage System Inflow=2.36 cfs 0.100 af
Outflow=2.36 cfs 0.100 af

Pond P1: BMP 1 Basin 1 Forebay Peak Elev=433.73' Storage=281 cf Inflow=2.10 cfs 0.142 af
Discarded=0.00 cfs 0.004 af Primary=2.09 cfs 0.132 af Outflow=2.10 cfs 0.137 af

Pond P2: BMP 1 Basin 1 Peak Elev=433.80' Storage=1,950 cf Inflow=2.24 cfs 0.143 af
Discarded=0.02 cfs 0.012 af Primary=2.09 cfs 0.093 af Outflow=2.11 cfs 0.105 af

Pond P3: BMP 1 Basin 2 Peak Elev=421.54' Storage=415 cf Inflow=2.34 cfs 0.111 af
Discarded=0.01 cfs 0.004 af Primary=0.14 cfs 0.001 af Secondary=2.36 cfs 0.100 af Outflow=2.51 cfs 0.104 af

Pond P4: BMP 2 Basin 1 Peak Elev=292.57' Storage=446 cf Inflow=8.28 cfs 0.562 af
Discarded=0.01 cfs 0.005 af Primary=8.24 cfs 0.551 af Outflow=8.25 cfs 0.556 af

Pond P5: BMP 2 Basin 2 Peak Elev=283.57' Storage=344 cf Inflow=8.39 cfs 0.561 af
Discarded=0.01 cfs 0.004 af Primary=8.42 cfs 0.553 af Outflow=8.42 cfs 0.557 af

Total Runoff Area = 4.070 ac Runoff Volume = 0.742 af Average Runoff Depth = 2.19"
32.93% Pervious = 1.340 ac 67.07% Impervious = 2.730 ac

Summary for Subcatchment C-1: BMP 1 Road

[49] Hint: Tc<2dt may require smaller dt

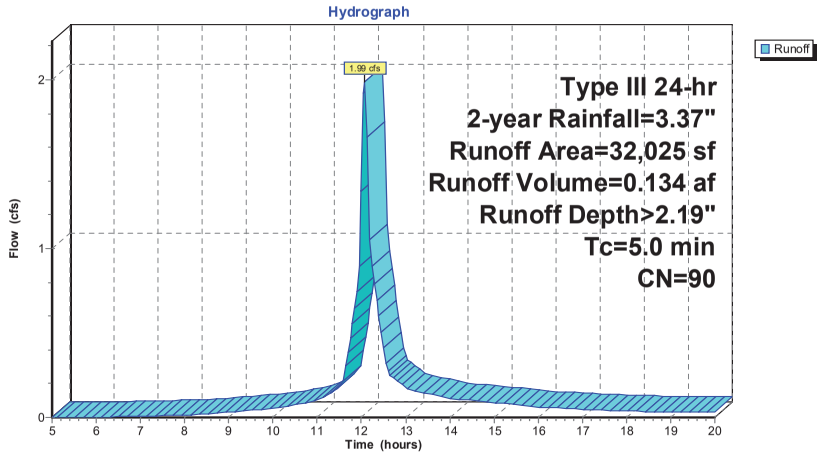
Runoff = 1.99 cfs @ 12.07 hrs, Volume= 0.134 af, Depth> 2.19"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

Area (sf)	CN	Description
10,657	74	>75% Grass cover, Good, HSG C
21,368	98	Unconnected pavement, HSG C
32,025	90	Weighted Average
10,657		33.28% Pervious Area
21,368		66.72% Impervious Area
21,368		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-1: BMP 1 Road



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Summary for Subcatchment C-2: BMP 1 Basin 1 Forebay

[49] Hint: Tc<2dt may require smaller dt

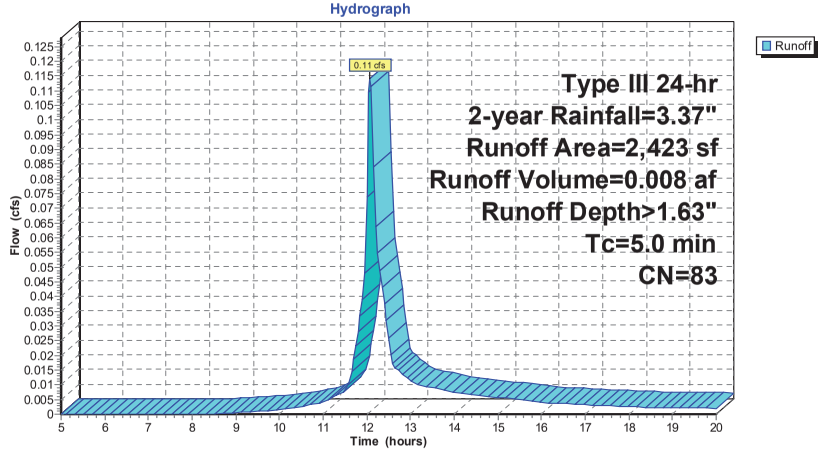
Runoff = 0.11 cfs @ 12.08 hrs, Volume= 0.008 af, Depth> 1.63"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Description
	1,563	74	>75% Grass cover, Good, HSG C
	399	98	Unconnected pavement, HSG C
*	461	98	Stormwater Basin
	2,423	83	Weighted Average
	1,563		64.51% Pervious Area
	860		35.49% Impervious Area
	399		46.40% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-2: BMP 1 Basin 1 Forebay



Summary for Subcatchment C-3: BMP 1 Basin 1 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

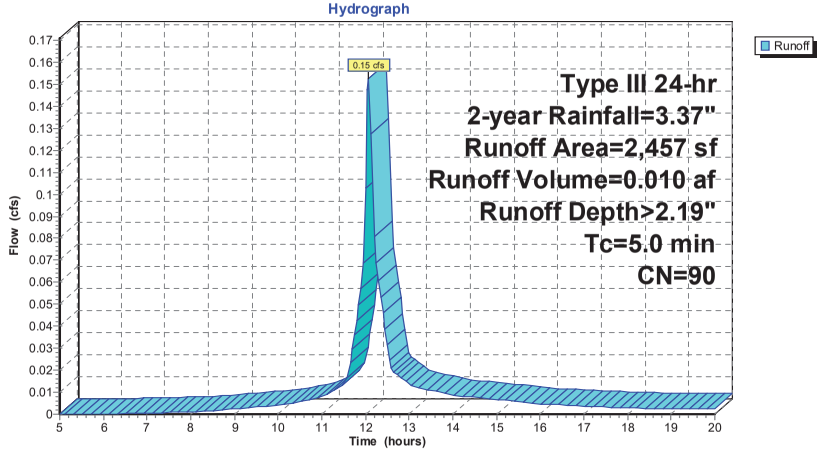
Runoff = 0.15 cfs @ 12.07 hrs, Volume= 0.010 af, Depth> 2.19"
Routed to Pond P2 : BMP 1 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Description
	775	74	>75% Grass cover, Good, HSG C
	256	98	Unconnected pavement, HSG C
*	1,426	98	Stormwater Basin
	2,457	90	Weighted Average
	775		31.54% Pervious Area
	1,682		68.46% Impervious Area
	256		15.22% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-3: BMP 1 Basin 1 Direct Flow



Summary for Subcatchment C-4: BMP 1 Basin 2 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

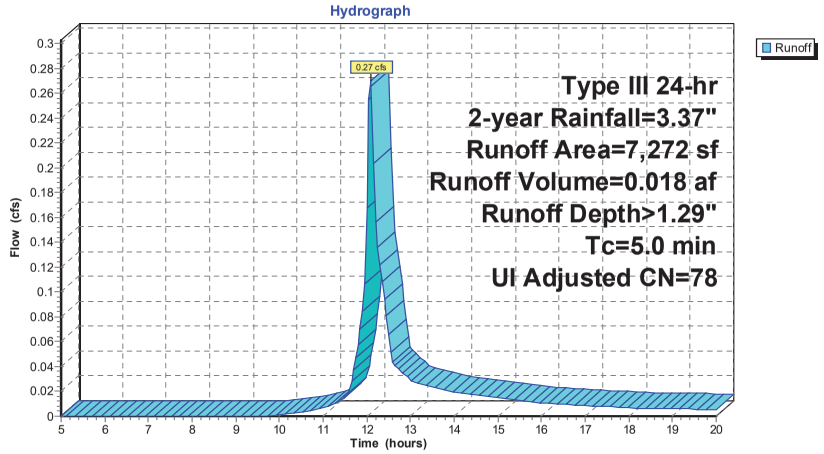
Runoff = 0.27 cfs @ 12.08 hrs, Volume= 0.018 af, Depth> 1.29"
Routed to Pond P3 : BMP 1 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Adj	Description
	5,430	74		>75% Grass cover, Good, HSG C
	1,225	98		Unconnected pavement, HSG C
*	617	98		Stormwater Basin
	7,272	80	78	Weighted Average, UI Adjusted
	5,430			74.67% Pervious Area
	1,842			25.33% Impervious Area
	1,225			66.50% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-4: BMP 1 Basin 2 Direct Flow



Summary for Subcatchment C-5: BMP 2 Road

[49] Hint: Tc<2dt may require smaller dt

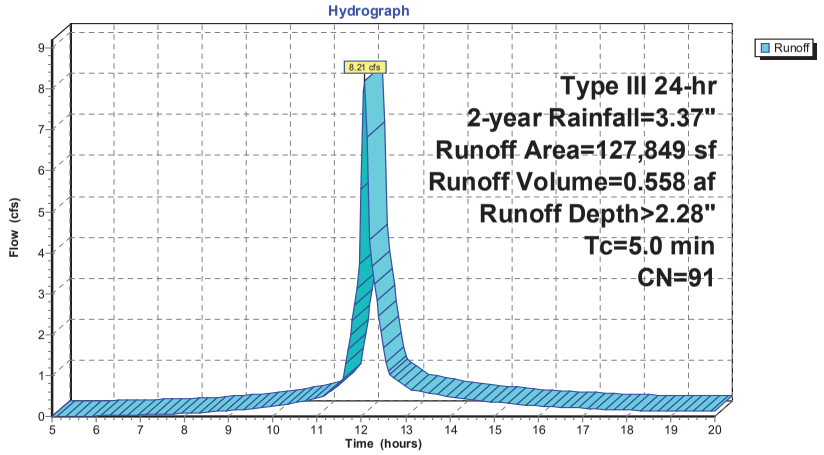
Runoff = 8.21 cfs @ 12.07 hrs, Volume= 0.558 af, Depth> 2.28"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

Area (sf)	CN	Description
35,874	74	>75% Grass cover, Good, HSG C
91,975	98	Unconnected pavement, HSG C
127,849	91	Weighted Average
35,874		28.06% Pervious Area
91,975		71.94% Impervious Area
91,975		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-5: BMP 2 Road



Summary for Subcatchment C-6: BMP 2 Basin 1

[49] Hint: Tc<2dt may require smaller dt

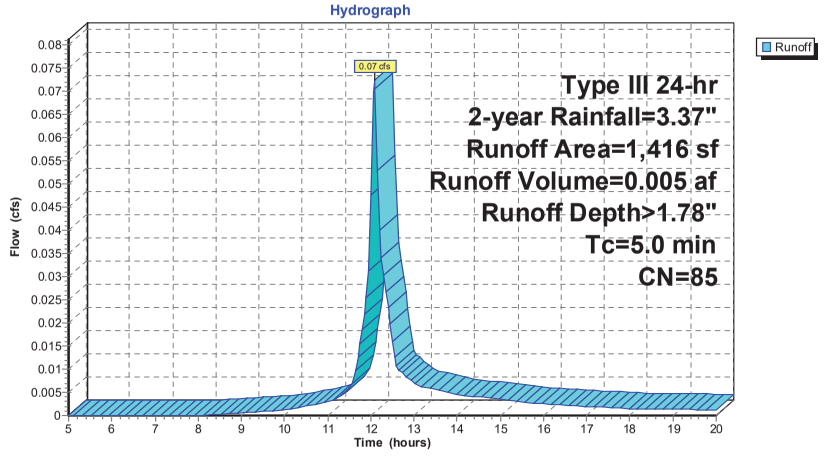
Runoff = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af, Depth> 1.78"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Description
	793	74	>75% Grass cover, Good, HSG C
*	623	98	Stormwater Basin
	1,416	85	Weighted Average
	793		56.00% Pervious Area
	623		44.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-6: BMP 2 Basin 1



Summary for Subcatchment C-7: BMP 2 Basin 2

[49] Hint: Tc<2dt may require smaller dt

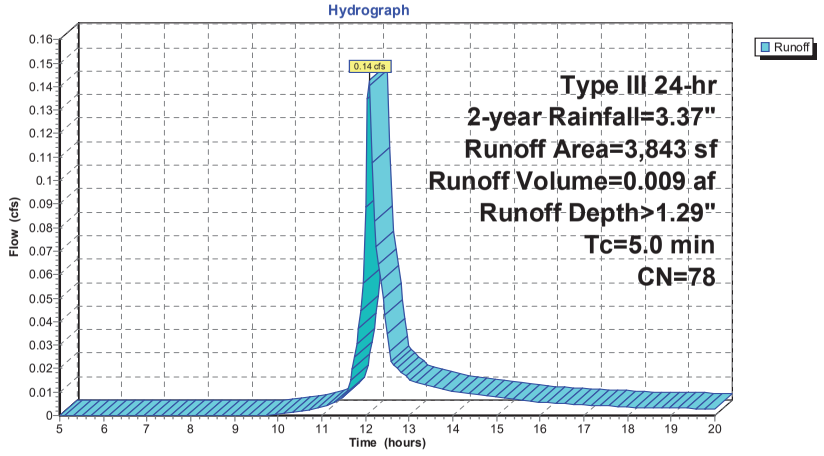
Runoff = 0.14 cfs @ 12.08 hrs, Volume= 0.009 af, Depth> 1.29"
Routed to Pond P5 : BMP 2 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Description
	3,282	74	>75% Grass cover, Good, HSG C
*	561	98	Stormwater Basin
	3,843	78	Weighted Average
	3,282		85.40% Pervious Area
	561		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-7: BMP 2 Basin 2



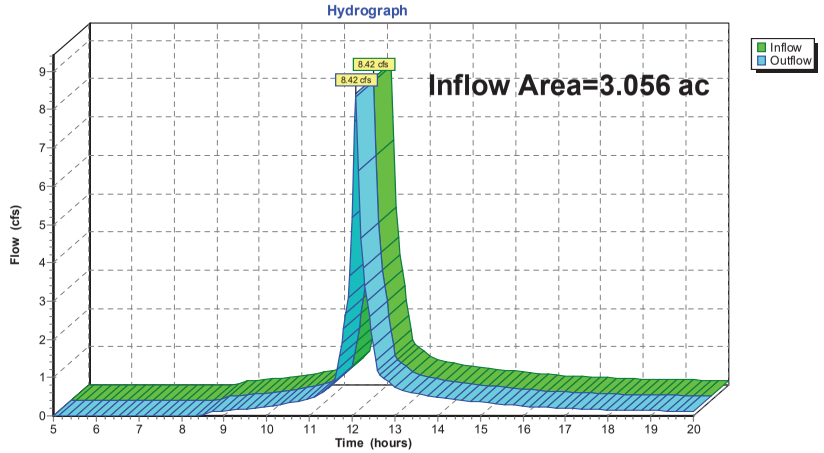
Summary for Reach DP-2: Existing Swale

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.056 ac, 69.99% Impervious, Inflow Depth > 2.17" for 2-year event
Inflow = 8.42 cfs @ 12.09 hrs, Volume= 0.553 af
Outflow = 8.42 cfs @ 12.09 hrs, Volume= 0.553 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Existing Swale



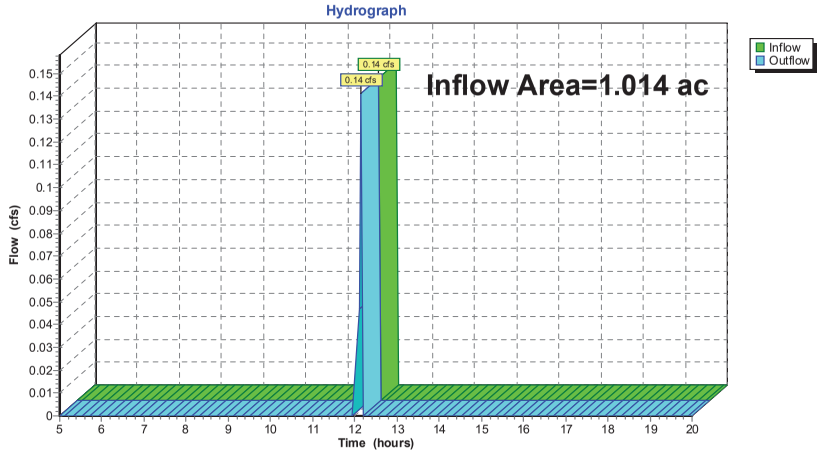
Summary for Reach DP1-A: Off-Site Sheet Flow

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.014 ac, 58.29% Impervious, Inflow Depth = 0.01" for 2-year event
Inflow = 0.14 cfs @ 12.15 hrs, Volume= 0.001 af
Outflow = 0.14 cfs @ 12.15 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-A: Off-Site Sheet Flow



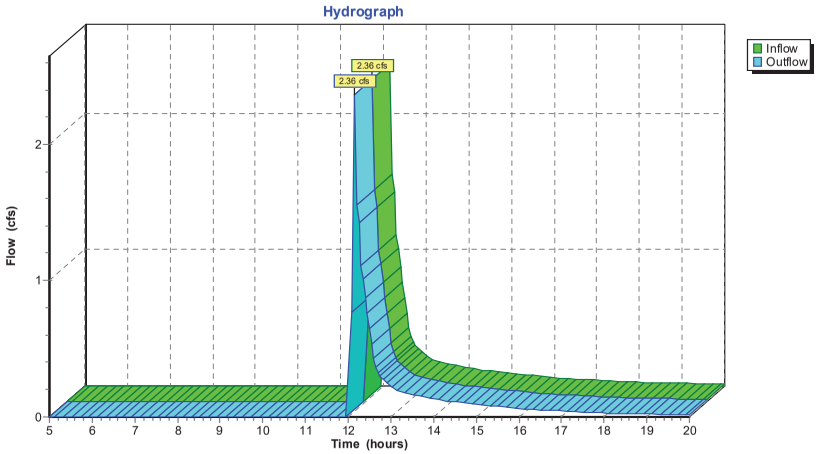
Summary for Reach DP1-B: Closed Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 2.36 cfs @ 12.15 hrs, Volume= 0.100 af
Outflow = 2.36 cfs @ 12.15 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-B: Closed Drainage System



Summary for Pond P1: BMP 1 Basin 1 Forebay

Inflow Area = 0.791 ac, 64.53% Impervious, Inflow Depth > 2.15" for 2-year event
Inflow = 2.10 cfs @ 12.07 hrs, Volume= 0.142 af
Outflow = 2.10 cfs @ 12.08 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.6 min
Discarded = 0.00 cfs @ 12.08 hrs, Volume= 0.004 af
Primary = 2.09 cfs @ 12.08 hrs, Volume= 0.132 af
Routed to Pond P2 : BMP 1 Basin 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.73' @ 12.08 hrs Surf.Area= 392 sf Storage= 281 cf

Plug-Flow detention time= 23.5 min calculated for 0.137 af (96% of inflow)
Center-of-Mass det. time= 9.8 min (783.0 - 773.2)

Volume	Invert	Avail.Storage	Storage Description
#1	432.50'	398 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

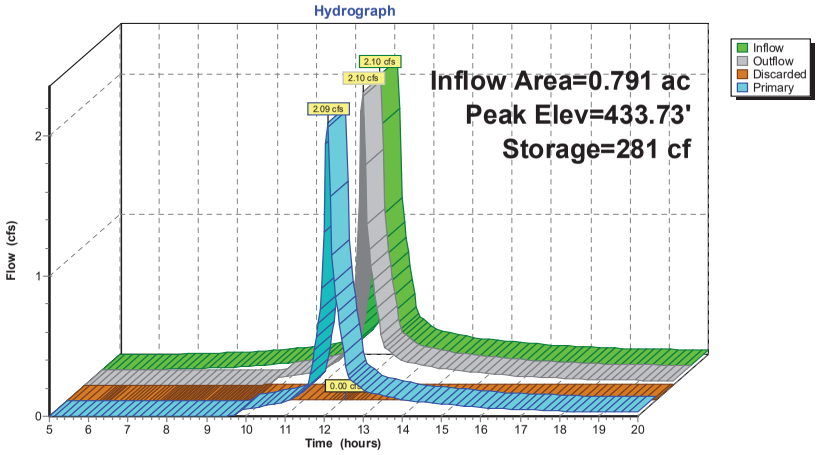
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
432.50	42	0	0
433.00	209	63	63
434.00	461	335	398

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	432.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 12.08 hrs HW=433.72' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=2.03 cfs @ 12.08 hrs HW=433.72' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 2.03 cfs @ 0.97 fps)

Pond P1: BMP 1 Basin 1 Forebay



Summary for Pond P2: BMP 1 Basin 1

[81] Warning: Exceeded Pond P1 by 0.09' @ 12.15 hrs

Inflow Area = 0.847 ac, 64.79% Impervious, Inflow Depth > 2.02" for 2-year event
Inflow = 2.24 cfs @ 12.08 hrs, Volume= 0.143 af
Outflow = 2.11 cfs @ 12.12 hrs, Volume= 0.105 af, Atten= 6%, Lag= 2.4 min
Discarded = 0.02 cfs @ 12.12 hrs, Volume= 0.012 af
Primary = 2.09 cfs @ 12.12 hrs, Volume= 0.093 af
Routed to Pond P3 : BMP 1 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.80' @ 12.12 hrs Surf.Area= 1,335 sf Storage= 1,950 cf

Plug-Flow detention time= 95.0 min calculated for 0.105 af (74% of inflow)
Center-of-Mass det. time= 36.1 min (816.8 - 780.7)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	2,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

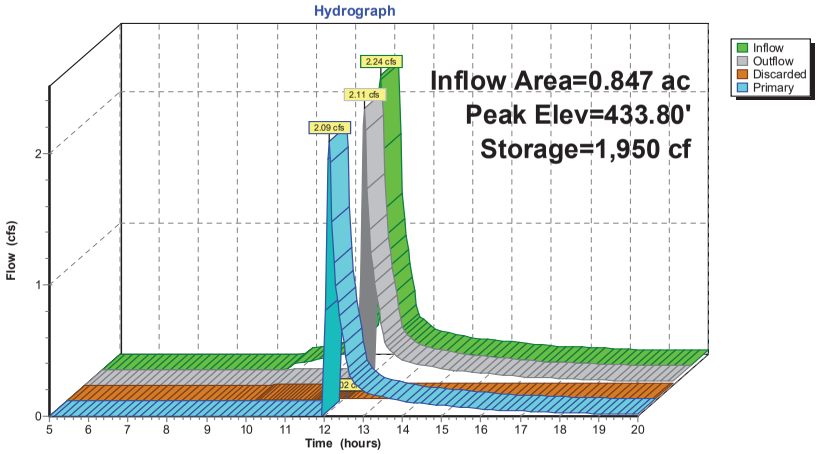
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	416	0	0
432.00	586	251	251
433.00	974	780	1,031
434.00	1,427	1,201	2,231
434.50	1,594	755	2,986

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**7.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	431.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.12 hrs HW=433.78' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.94 cfs @ 12.12 hrs HW=433.78' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.94 cfs @ 1.19 fps)

Pond P2: BMP 1 Basin 1



Summary for Pond P3: BMP 1 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 1.014 ac, 58.29% Impervious, Inflow Depth > 1.32" for 2-year event
Inflow = 2.34 cfs @ 12.12 hrs, Volume= 0.111 af
Outflow = 2.51 cfs @ 12.15 hrs, Volume= 0.104 af, Atten= 0%, Lag= 1.7 min
Discarded = 0.01 cfs @ 12.15 hrs, Volume= 0.004 af
Primary = 0.14 cfs @ 12.15 hrs, Volume= 0.001 af
Routed to Reach DP1-A : Off-Site Sheet Flow
Secondary = 2.36 cfs @ 12.15 hrs, Volume= 0.100 af
Routed to Reach DP1-B : Closed Drainage System

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 421.54' @ 12.15 hrs Surf.Area= 473 sf Storage= 415 cf

Plug-Flow detention time= 27.5 min calculated for 0.104 af (93% of inflow)
Center-of-Mass det. time= 7.3 min (812.3 - 805.0)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	1,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	103	0	0
421.00	308	206	206
422.00	616	462	668
422.50	726	336	1,003

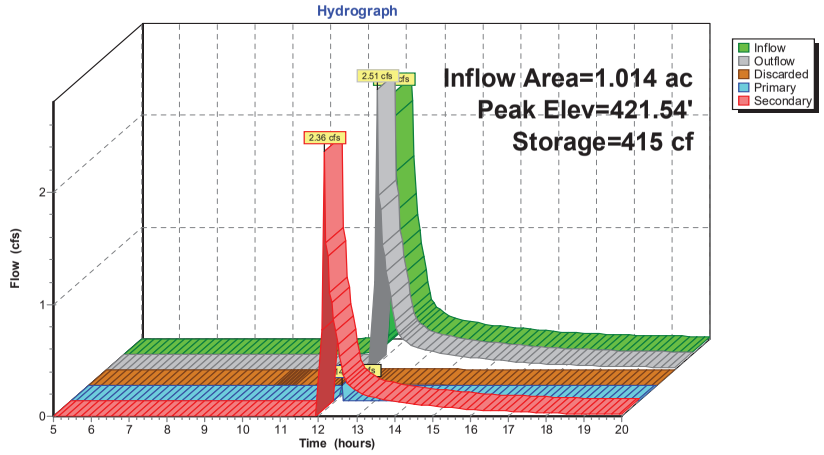
Device	Routing	Invert	Outlet Devices
#1	Primary	421.50'	**8.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Secondary	421.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	420.00'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.15 hrs HW=421.54' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.14 cfs @ 12.15 hrs HW=421.54' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.14 cfs @ 0.47 fps)

Secondary OutFlow Max=2.36 cfs @ 12.15 hrs HW=421.54' (Free Discharge)
↑**2=Orifice/Grate** (Weir Controls 2.36 cfs @ 1.59 fps)

Pond P3: BMP 1 Basin 2



Summary for Pond P4: BMP 2 Basin 1

Inflow Area = 2.968 ac, 71.63% Impervious, Inflow Depth > 2.27" for 2-year event
Inflow = 8.28 cfs @ 12.07 hrs, Volume= 0.562 af
Outflow = 8.25 cfs @ 12.08 hrs, Volume= 0.556 af, Atten= 0%, Lag= 0.5 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 8.24 cfs @ 12.08 hrs, Volume= 0.551 af
Routed to Pond P5 : BMP 2 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 292.57' @ 12.08 hrs Surf.Area= 481 sf Storage= 446 cf

Plug-Flow detention time= 8.4 min calculated for 0.555 af (99% of inflow)
Center-of-Mass det. time= 4.1 min (772.6 - 768.5)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	1,012 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

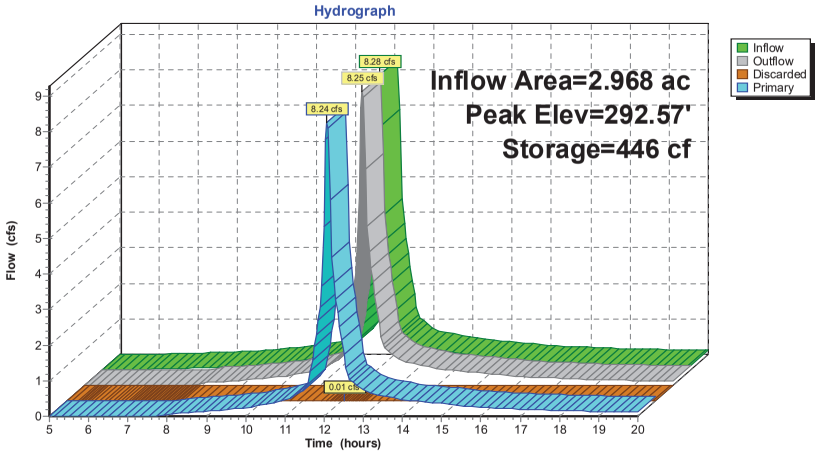
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.00	110	0	0
292.00	325	218	218
293.00	600	463	680
293.50	729	332	1,012

Device	Routing	Invert	Outlet Devices
#1	Primary	292.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	291.00'	**0.510 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=292.56' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=7.97 cfs @ 12.08 hrs HW=292.56' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 7.97 cfs @ 1.75 fps)

Pond P4: BMP 2 Basin 1



Summary for Pond P5: BMP 2 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.056 ac, 69.99% Impervious, Inflow Depth > 2.20" for 2-year event
Inflow = 8.39 cfs @ 12.08 hrs, Volume= 0.561 af
Outflow = 8.42 cfs @ 12.09 hrs, Volume= 0.557 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.09 hrs, Volume= 0.004 af
Primary = 8.42 cfs @ 12.09 hrs, Volume= 0.553 af
Routed to Reach DP-2 : Existing Swale

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 283.57' @ 12.09 hrs Surf.Area= 435 sf Storage= 344 cf

Plug-Flow detention time= 5.4 min calculated for 0.555 af (99% of inflow)
Center-of-Mass det. time= 2.4 min (775.4 - 773.0)

Volume	Invert	Avail.Storage	Storage Description
#1	282.00'	867 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

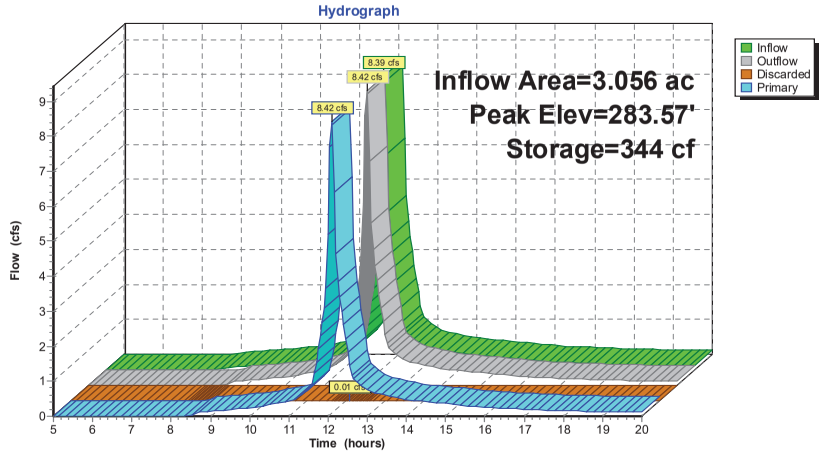
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
282.00	25	0	0
283.00	263	144	144
284.00	563	413	557
284.50	675	310	867

Device	Routing	Invert	Outlet Devices
#1	Discarded	282.00'	**0.510 in/hr Exfiltration over Surface area**
#2	Primary	283.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 12.09 hrs HW=283.56' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=8.17 cfs @ 12.09 hrs HW=283.56' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 8.17 cfs @ 1.76 fps)

Pond P5: BMP 2 Basin 2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentC-1: BMP 1 Road Runoff Area=32,025 sf 66.72% Impervious Runoff Depth>3.86"
Tc=5.0 min CN=90 Runoff=3.40 cfs 0.236 af

SubcatchmentC-2: BMP 1 Basin 1 Forebay Runoff Area=2,423 sf 35.49% Impervious Runoff Depth>3.16"
Tc=5.0 min CN=83 Runoff=0.22 cfs 0.015 af

SubcatchmentC-3: BMP 1 Basin 1 Direct Runoff Area=2,457 sf 68.46% Impervious Runoff Depth>3.86"
Tc=5.0 min CN=90 Runoff=0.26 cfs 0.018 af

SubcatchmentC-4: BMP 1 Basin 2 Direct Runoff Area=7,272 sf 25.33% Impervious Runoff Depth>2.70"
Tc=5.0 min UI Adjusted CN=78 Runoff=0.57 cfs 0.038 af

SubcatchmentC-5: BMP 2 Road Runoff Area=127,849 sf 71.94% Impervious Runoff Depth>3.96"
Tc=5.0 min CN=91 Runoff=13.84 cfs 0.968 af

SubcatchmentC-6: BMP 2 Basin 1 Runoff Area=1,416 sf 44.00% Impervious Runoff Depth>3.35"
Tc=5.0 min CN=85 Runoff=0.13 cfs 0.009 af

SubcatchmentC-7: BMP 2 Basin 2 Runoff Area=3,843 sf 14.60% Impervious Runoff Depth>2.70"
Tc=5.0 min CN=78 Runoff=0.30 cfs 0.020 af

Reach DP-2: Existing Swale Inflow=14.22 cfs 0.977 af
Outflow=14.22 cfs 0.977 af

Reach DP1-A: Off-Site Sheet Flow Inflow=0.71 cfs 0.009 af
Outflow=0.71 cfs 0.009 af

Reach DP1-B: Closed Drainage System Inflow=3.54 cfs 0.225 af
Outflow=3.54 cfs 0.225 af

Pond P1: BMP 1 Basin 1 Forebay Peak Elev=433.80' Storage=311 cf Inflow=3.62 cfs 0.251 af
Discarded=0.00 cfs 0.005 af Primary=3.60 cfs 0.241 af Outflow=3.60 cfs 0.246 af

Pond P2: BMP 1 Basin 1 Peak Elev=433.90' Storage=2,094 cf Inflow=3.86 cfs 0.259 af
Discarded=0.02 cfs 0.013 af Primary=3.73 cfs 0.208 af Outflow=3.74 cfs 0.221 af

Pond P3: BMP 1 Basin 2 Peak Elev=421.61' Storage=451 cf Inflow=4.27 cfs 0.245 af
Discarded=0.01 cfs 0.004 af Primary=0.71 cfs 0.009 af Secondary=3.54 cfs 0.225 af Outflow=4.26 cfs 0.238 af

Pond P4: BMP 2 Basin 1 Peak Elev=292.74' Storage=535 cf Inflow=13.97 cfs 0.977 af
Discarded=0.01 cfs 0.005 af Primary=13.88 cfs 0.966 af Outflow=13.89 cfs 0.971 af

Pond P5: BMP 2 Basin 2 Peak Elev=283.75' Storage=428 cf Inflow=14.18 cfs 0.985 af
Discarded=0.01 cfs 0.004 af Primary=14.22 cfs 0.977 af Outflow=14.22 cfs 0.981 af

Total Runoff Area = 4.070 ac Runoff Volume = 1.303 af Average Runoff Depth = 3.84"
32.93% Pervious = 1.340 ac 67.07% Impervious = 2.730 ac

Summary for Subcatchment C-1: BMP 1 Road

[49] Hint: Tc<2dt may require smaller dt

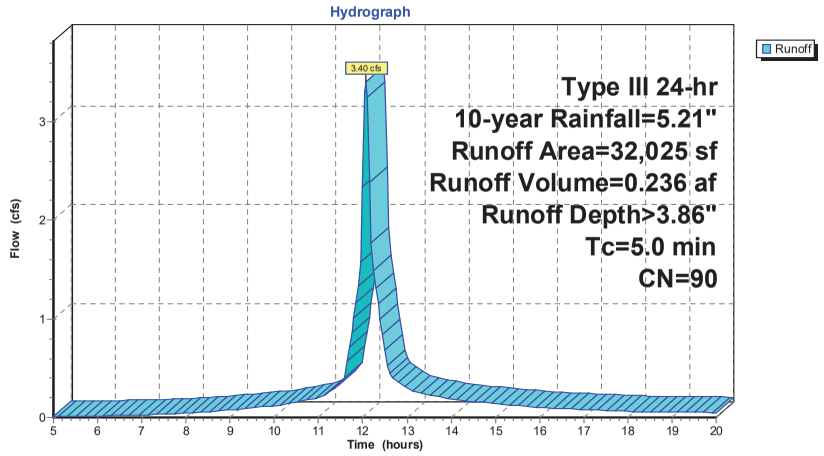
Runoff = 3.40 cfs @ 12.07 hrs, Volume= 0.236 af, Depth> 3.86"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

Area (sf)	CN	Description
10,657	74	>75% Grass cover, Good, HSG C
21,368	98	Unconnected pavement, HSG C
32,025	90	Weighted Average
10,657		33.28% Pervious Area
21,368		66.72% Impervious Area
21,368		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-1: BMP 1 Road



Summary for Subcatchment C-2: BMP 1 Basin 1 Forebay

[49] Hint: Tc<2dt may require smaller dt

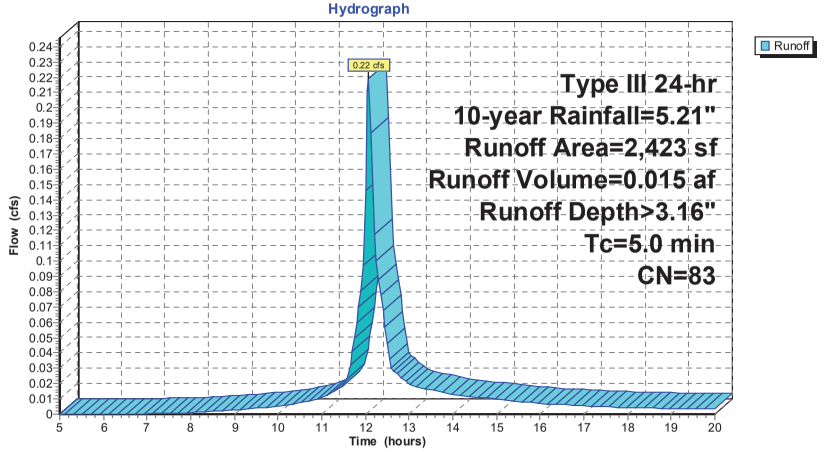
Runoff = 0.22 cfs @ 12.07 hrs, Volume= 0.015 af, Depth> 3.16"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Description
	1,563	74	>75% Grass cover, Good, HSG C
	399	98	Unconnected pavement, HSG C
*	461	98	Stormwater Basin
	2,423	83	Weighted Average
	1,563		64.51% Pervious Area
	860		35.49% Impervious Area
	399		46.40% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-2: BMP 1 Basin 1 Forebay



Summary for Subcatchment C-3: BMP 1 Basin 1 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

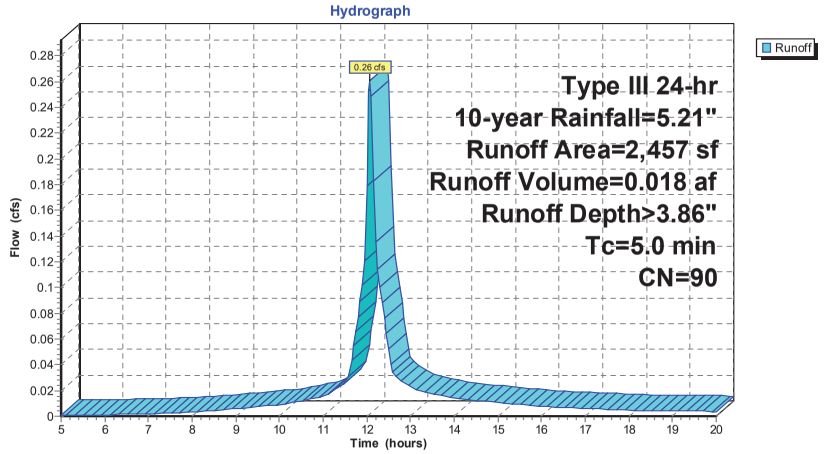
Runoff = 0.26 cfs @ 12.07 hrs, Volume= 0.018 af, Depth> 3.86"
Routed to Pond P2 : BMP 1 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Description
	775	74	>75% Grass cover, Good, HSG C
	256	98	Unconnected pavement, HSG C
*	1,426	98	Stormwater Basin
	2,457	90	Weighted Average
	775		31.54% Pervious Area
	1,682		68.46% Impervious Area
	256		15.22% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-3: BMP 1 Basin 1 Direct Flow



Summary for Subcatchment C-4: BMP 1 Basin 2 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

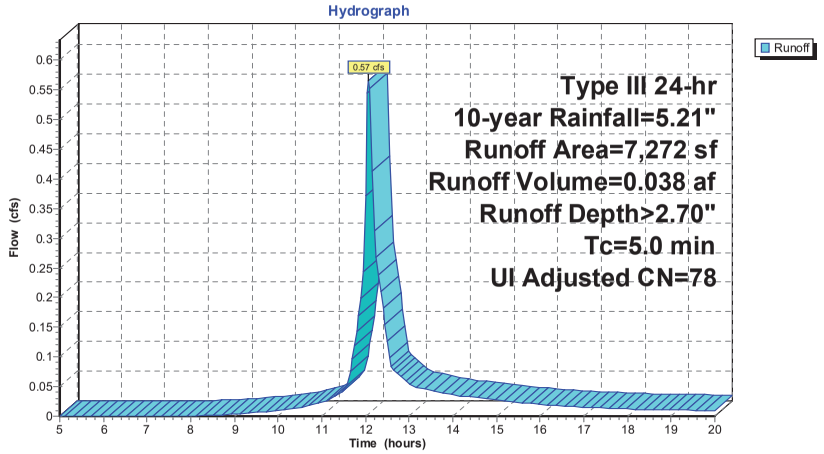
Runoff = 0.57 cfs @ 12.08 hrs, Volume= 0.038 af, Depth> 2.70"
Routed to Pond P3 : BMP 1 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Adj	Description
	5,430	74		>75% Grass cover, Good, HSG C
	1,225	98		Unconnected pavement, HSG C
*	617	98		Stormwater Basin
	7,272	80	78	Weighted Average, UI Adjusted
	5,430			74.67% Pervious Area
	1,842			25.33% Impervious Area
	1,225			66.50% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-4: BMP 1 Basin 2 Direct Flow



Summary for Subcatchment C-5: BMP 2 Road

[49] Hint: Tc<2dt may require smaller dt

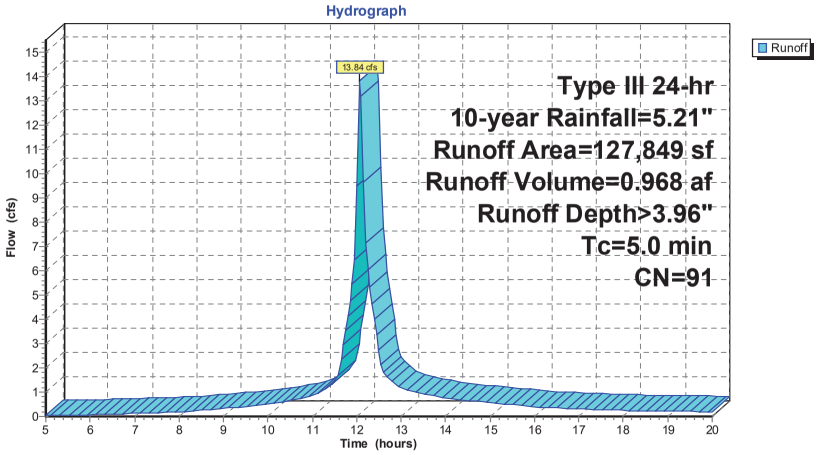
Runoff = 13.84 cfs @ 12.07 hrs, Volume= 0.968 af, Depth> 3.96"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

Area (sf)	CN	Description
35,874	74	>75% Grass cover, Good, HSG C
91,975	98	Unconnected pavement, HSG C
127,849	91	Weighted Average
35,874		28.06% Pervious Area
91,975		71.94% Impervious Area
91,975		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-5: BMP 2 Road



Summary for Subcatchment C-6: BMP 2 Basin 1

[49] Hint: Tc<2dt may require smaller dt

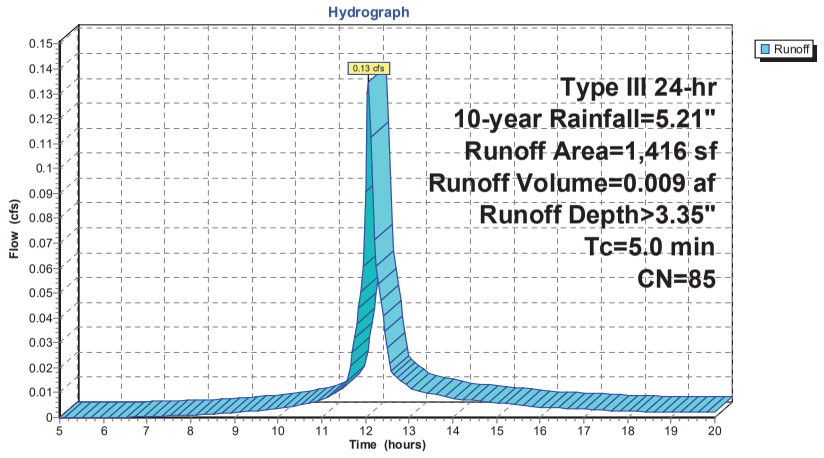
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af, Depth> 3.35"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Description
	793	74	>75% Grass cover, Good, HSG C
*	623	98	Stormwater Basin
	1,416	85	Weighted Average
	793		56.00% Pervious Area
	623		44.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-6: BMP 2 Basin 1



Summary for Subcatchment C-7: BMP 2 Basin 2

[49] Hint: Tc<2dt may require smaller dt

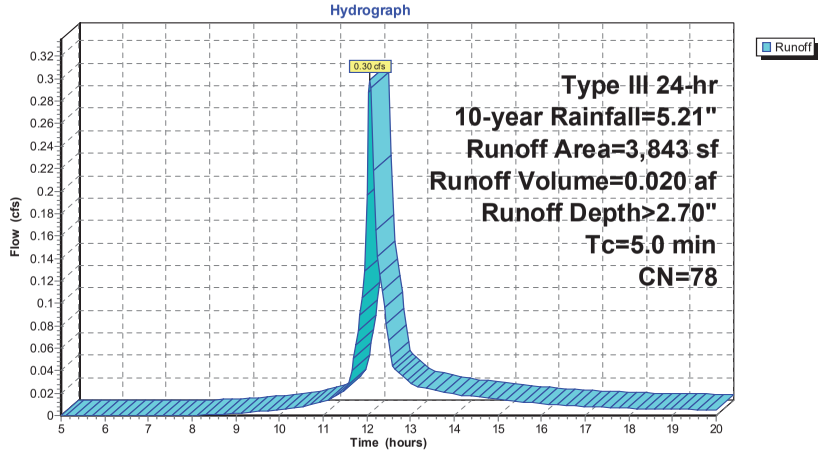
Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.020 af, Depth> 2.70"
Routed to Pond P5 : BMP 2 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Description
	3,282	74	>75% Grass cover, Good, HSG C
*	561	98	Stormwater Basin
	3,843	78	Weighted Average
	3,282		85.40% Pervious Area
	561		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-7: BMP 2 Basin 2



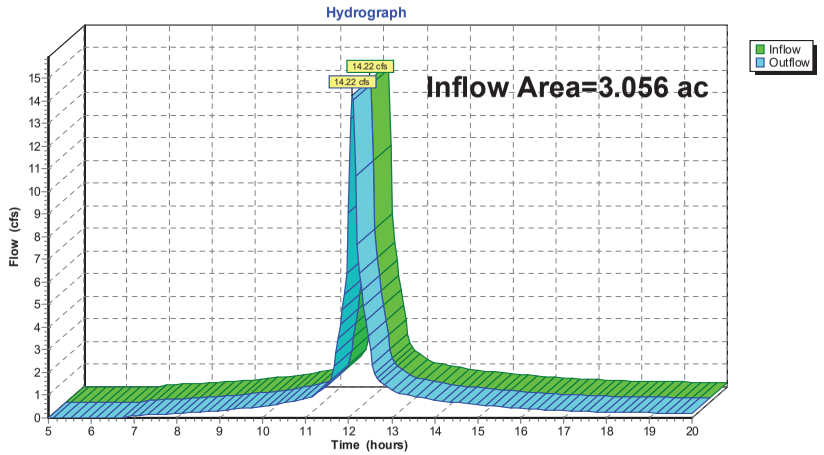
Summary for Reach DP-2: Existing Swale

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.056 ac, 69.99% Impervious, Inflow Depth > 3.84" for 10-year event
Inflow = 14.22 cfs @ 12.08 hrs, Volume= 0.977 af
Outflow = 14.22 cfs @ 12.08 hrs, Volume= 0.977 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Existing Swale



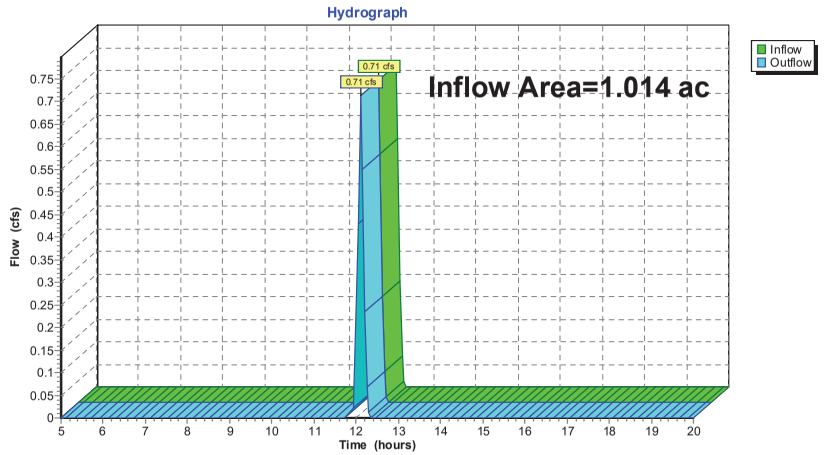
Summary for Reach DP1-A: Off-Site Sheet Flow

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.014 ac, 58.29% Impervious, Inflow Depth = 0.10" for 10-year event
Inflow = 0.71 cfs @ 12.11 hrs, Volume= 0.009 af
Outflow = 0.71 cfs @ 12.11 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-A: Off-Site Sheet Flow



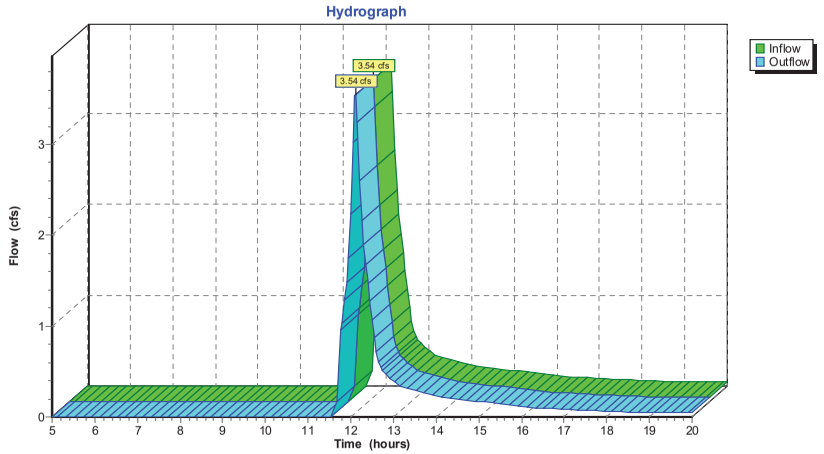
Summary for Reach DP1-B: Closed Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 3.54 cfs @ 12.11 hrs, Volume= 0.225 af
Outflow = 3.54 cfs @ 12.11 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-B: Closed Drainage System



Summary for Pond P1: BMP 1 Basin 1 Forebay

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.791 ac, 64.53% Impervious, Inflow Depth > 3.81" for 10-year event
Inflow = 3.62 cfs @ 12.07 hrs, Volume= 0.251 af
Outflow = 3.60 cfs @ 12.08 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.5 min
Discarded = 0.00 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 3.60 cfs @ 12.08 hrs, Volume= 0.241 af
Routed to Pond P2 : BMP 1 Basin 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.80' @ 12.08 hrs Surf.Area= 411 sf Storage= 311 cf

Plug-Flow detention time= 15.8 min calculated for 0.246 af (98% of inflow)
Center-of-Mass det. time= 7.5 min (767.5 - 760.0)

Volume	Invert	Avail.Storage	Storage Description
#1	432.50'	398 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

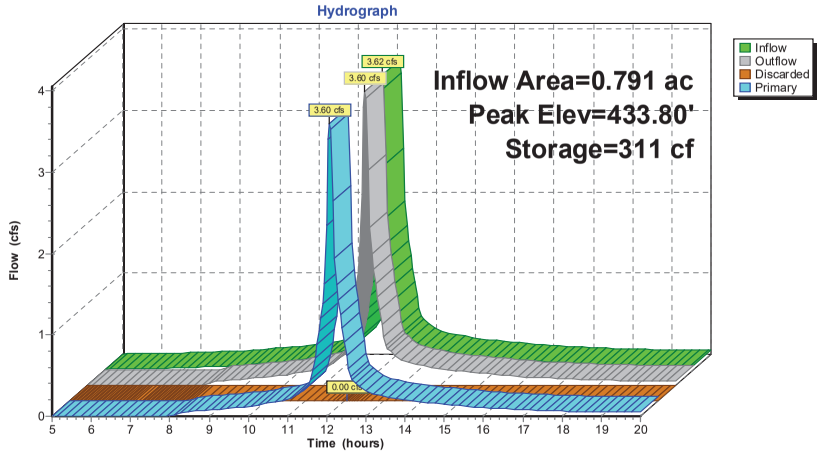
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
432.50	42	0	0
433.00	209	63	63
434.00	461	335	398

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	432.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 12.08 hrs HW=433.80' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=3.48 cfs @ 12.08 hrs HW=433.80' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 3.48 cfs @ 1.18 fps)

Pond P1: BMP 1 Basin 1 Forebay



Summary for Pond P2: BMP 1 Basin 1

[81] Warning: Exceeded Pond P1 by 0.12' @ 12.15 hrs

Inflow Area = 0.847 ac, 64.79% Impervious, Inflow Depth > 3.67" for 10-year event
Inflow = 3.86 cfs @ 12.08 hrs, Volume= 0.259 af
Outflow = 3.74 cfs @ 12.10 hrs, Volume= 0.221 af, Atten= 3%, Lag= 1.5 min
Discarded = 0.02 cfs @ 12.10 hrs, Volume= 0.013 af
Primary = 3.73 cfs @ 12.10 hrs, Volume= 0.208 af
Routed to Pond P3 : BMP 1 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.90' @ 12.10 hrs Surf.Area= 1,383 sf Storage= 2,094 cf

Plug-Flow detention time= 68.9 min calculated for 0.220 af (85% of inflow)
Center-of-Mass det. time= 27.5 min (794.0 - 766.5)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	2,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

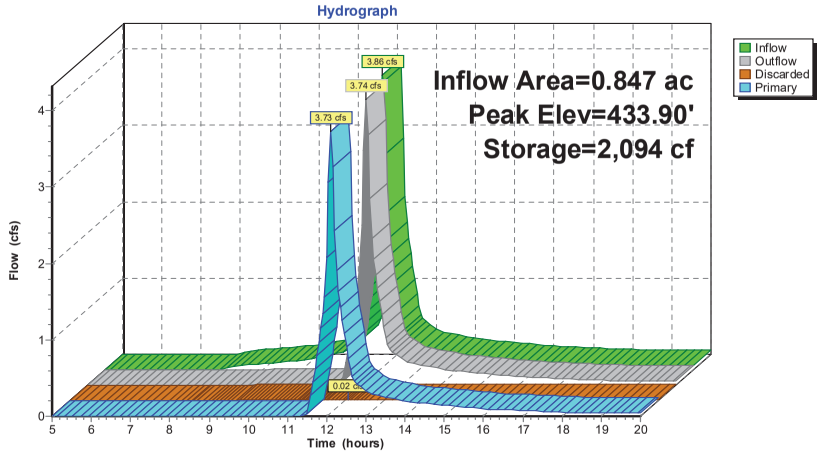
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	416	0	0
432.00	586	251	251
433.00	974	780	1,031
434.00	1,427	1,201	2,231
434.50	1,594	755	2,986

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**7.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	431.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.10 hrs HW=433.90' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=3.68 cfs @ 12.10 hrs HW=433.90' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 3.68 cfs @ 1.50 fps)

Pond P2: BMP 1 Basin 1



Summary for Pond P3: BMP 1 Basin 2

Inflow Area = 1.014 ac, 58.29% Impervious, Inflow Depth > 2.90" for 10-year event
Inflow = 4.27 cfs @ 12.10 hrs, Volume= 0.245 af
Outflow = 4.26 cfs @ 12.11 hrs, Volume= 0.238 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.004 af
Primary = 0.71 cfs @ 12.11 hrs, Volume= 0.009 af
Routed to Reach DP1-A : Off-Site Sheet Flow
Secondary = 3.54 cfs @ 12.11 hrs, Volume= 0.225 af
Routed to Reach DP1-B : Closed Drainage System

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 421.61' @ 12.11 hrs Surf.Area= 496 sf Storage= 451 cf

Plug-Flow detention time= 14.9 min calculated for 0.237 af (97% of inflow)
Center-of-Mass det. time= 4.3 min (793.4 - 789.1)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	1,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	103	0	0
421.00	308	206	206
422.00	616	462	668
422.50	726	336	1,003

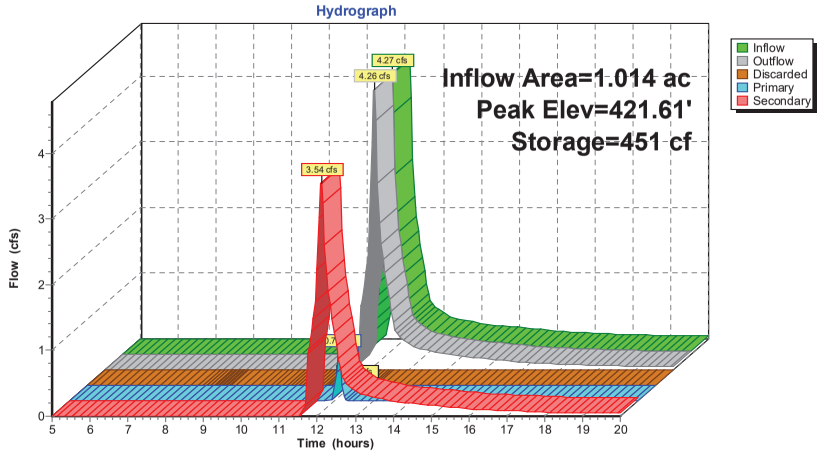
Device	Routing	Invert	Outlet Devices
#1	Primary	421.50'	**8.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Secondary	421.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	420.00'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=421.61' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.68 cfs @ 12.11 hrs HW=421.61' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.68 cfs @ 0.80 fps)

Secondary OutFlow Max=3.49 cfs @ 12.11 hrs HW=421.61' (Free Discharge)
↑**2=Orifice/Grate** (Weir Controls 3.49 cfs @ 1.81 fps)

Pond P3: BMP 1 Basin 2



Summary for Pond P4: BMP 2 Basin 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.968 ac, 71.63% Impervious, Inflow Depth > 3.95" for 10-year event
Inflow = 13.97 cfs @ 12.07 hrs, Volume= 0.977 af
Outflow = 13.89 cfs @ 12.08 hrs, Volume= 0.971 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 13.88 cfs @ 12.08 hrs, Volume= 0.966 af
Routed to Pond P5 : BMP 2 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 292.74' @ 12.08 hrs Surf.Area= 529 sf Storage= 535 cf

Plug-Flow detention time= 5.7 min calculated for 0.971 af (99% of inflow)
Center-of-Mass det. time= 3.0 min (759.1 - 756.1)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	1,012 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

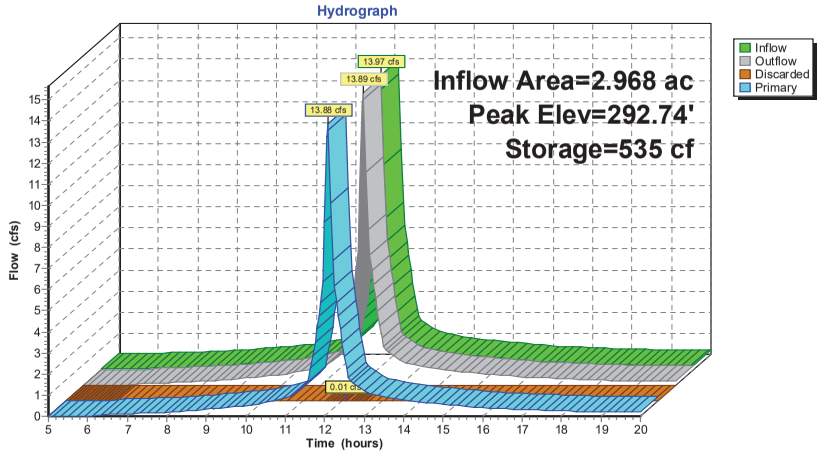
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.00	110	0	0
292.00	325	218	218
293.00	600	463	680
293.50	729	332	1,012

Device	Routing	Invert	Outlet Devices
#1	Primary	292.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	291.00'	**0.510 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=292.73' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=13.43 cfs @ 12.08 hrs HW=292.73' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 13.43 cfs @ 2.13 fps)

Pond P4: BMP 2 Basin 1



Summary for Pond P5: BMP 2 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.056 ac, 69.99% Impervious, Inflow Depth > 3.87" for 10-year event
Inflow = 14.18 cfs @ 12.08 hrs, Volume= 0.985 af
Outflow = 14.22 cfs @ 12.08 hrs, Volume= 0.981 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.004 af
Primary = 14.22 cfs @ 12.08 hrs, Volume= 0.977 af
Routed to Reach DP-2 : Existing Swale

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 283.75' @ 12.08 hrs Surf.Area= 489 sf Storage= 428 cf

Plug-Flow detention time= 3.7 min calculated for 0.978 af (99% of inflow)
Center-of-Mass det. time= 1.9 min (761.5 - 759.6)

Volume	Invert	Avail.Storage	Storage Description
#1	282.00'	867 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

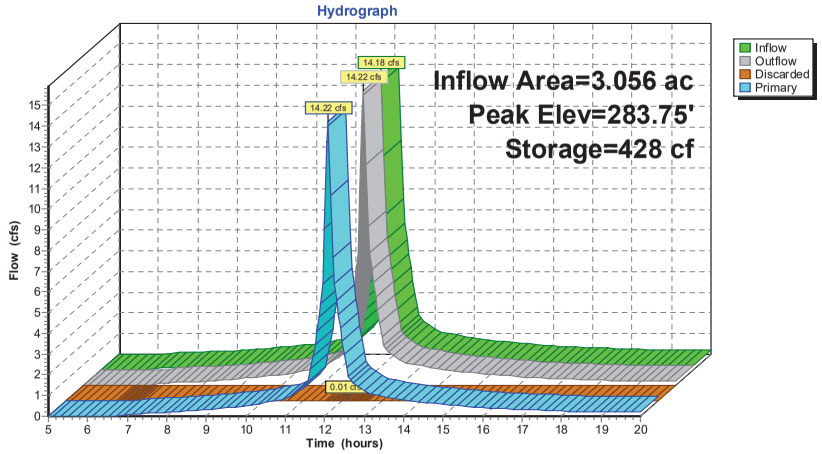
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
282.00	25	0	0
283.00	263	144	144
284.00	563	413	557
284.50	675	310	867

Device	Routing	Invert	Outlet Devices
#1	Discarded	282.00'	**0.510 in/hr Exfiltration over Surface area**
#2	Primary	283.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=283.74' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=13.77 cfs @ 12.08 hrs HW=283.74' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 13.77 cfs @ 2.15 fps)

Pond P5: BMP 2 Basin 2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment C-1: BMP 1 Road Runoff Area=32,025 sf 66.72% Impervious Runoff Depth>4.91"
Tc=5.0 min CN=90 Runoff=4.28 cfs 0.301 af

Subcatchment C-2: BMP 1 Basin 1 Forebay Runoff Area=2,423 sf 35.49% Impervious Runoff Depth>4.17"
Tc=5.0 min CN=83 Runoff=0.29 cfs 0.019 af

Subcatchment C-3: BMP 1 Basin 1 Direct Runoff Area=2,457 sf 68.46% Impervious Runoff Depth>4.91"
Tc=5.0 min CN=90 Runoff=0.33 cfs 0.023 af

Subcatchment C-4: BMP 1 Basin 2 Direct Runoff Area=7,272 sf 25.33% Impervious Runoff Depth>3.65"
Tc=5.0 min UI Adjusted CN=78 Runoff=0.76 cfs 0.051 af

Subcatchment C-5: BMP 2 Road Runoff Area=127,849 sf 71.94% Impervious Runoff Depth>5.02"
Tc=5.0 min CN=91 Runoff=17.32 cfs 1.227 af

Subcatchment C-6: BMP 2 Basin 1 Runoff Area=1,416 sf 44.00% Impervious Runoff Depth>4.38"
Tc=5.0 min CN=85 Runoff=0.17 cfs 0.012 af

Subcatchment C-7: BMP 2 Basin 2 Runoff Area=3,843 sf 14.60% Impervious Runoff Depth>3.65"
Tc=5.0 min CN=78 Runoff=0.40 cfs 0.027 af

Reach DP-2: Existing Swale Inflow=17.85 cfs 1.245 af
Outflow=17.85 cfs 1.245 af

Reach DP1-A: Off-Site Sheet Flow Inflow=1.16 cfs 0.017 af
Outflow=1.16 cfs 0.017 af

Reach DP1-B: Closed Drainage System Inflow=4.29 cfs 0.303 af
Outflow=4.29 cfs 0.303 af

Pond P1: BMP 1 Basin 1 Forebay Peak Elev=433.84' Storage=328 cf Inflow=4.56 cfs 0.320 af
Discarded=0.01 cfs 0.005 af Primary=4.53 cfs 0.310 af Outflow=4.54 cfs 0.315 af

Pond P2: BMP 1 Basin 1 Peak Elev=433.96' Storage=2,172 cf Inflow=4.86 cfs 0.333 af
Discarded=0.02 cfs 0.014 af Primary=4.73 cfs 0.281 af Outflow=4.74 cfs 0.295 af

Pond P3: BMP 1 Basin 2 Peak Elev=421.65' Storage=472 cf Inflow=5.46 cfs 0.332 af
Discarded=0.01 cfs 0.004 af Primary=1.16 cfs 0.017 af Secondary=4.29 cfs 0.303 af Outflow=5.46 cfs 0.324 af

Pond P4: BMP 2 Basin 1 Peak Elev=292.85' Storage=593 cf Inflow=17.49 cfs 1.239 af
Discarded=0.01 cfs 0.005 af Primary=17.39 cfs 1.227 af Outflow=17.40 cfs 1.233 af

Pond P5: BMP 2 Basin 2 Peak Elev=283.86' Storage=483 cf Inflow=17.79 cfs 1.254 af
Discarded=0.01 cfs 0.004 af Primary=17.85 cfs 1.245 af Outflow=17.85 cfs 1.250 af

Total Runoff Area = 4.070 ac Runoff Volume = 1.660 af Average Runoff Depth = 4.89"
32.93% Pervious = 1.340 ac 67.07% Impervious = 2.730 ac

Summary for Subcatchment C-1: BMP 1 Road

[49] Hint: Tc<2dt may require smaller dt

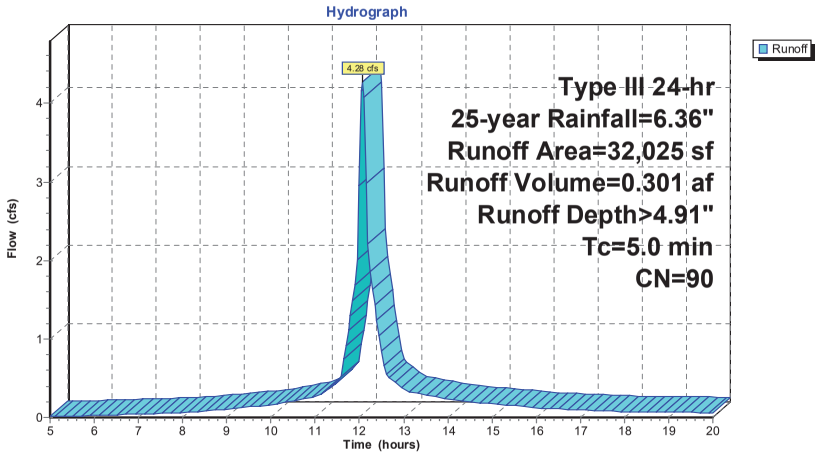
Runoff = 4.28 cfs @ 12.07 hrs, Volume= 0.301 af, Depth> 4.91"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.36"

Area (sf)	CN	Description
10,657	74	>75% Grass cover, Good, HSG C
21,368	98	Unconnected pavement, HSG C
32,025	90	Weighted Average
10,657		33.28% Pervious Area
21,368		66.72% Impervious Area
21,368		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-1: BMP 1 Road



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Summary for Subcatchment C-2: BMP 1 Basin 1 Forebay

[49] Hint: Tc<2dt may require smaller dt

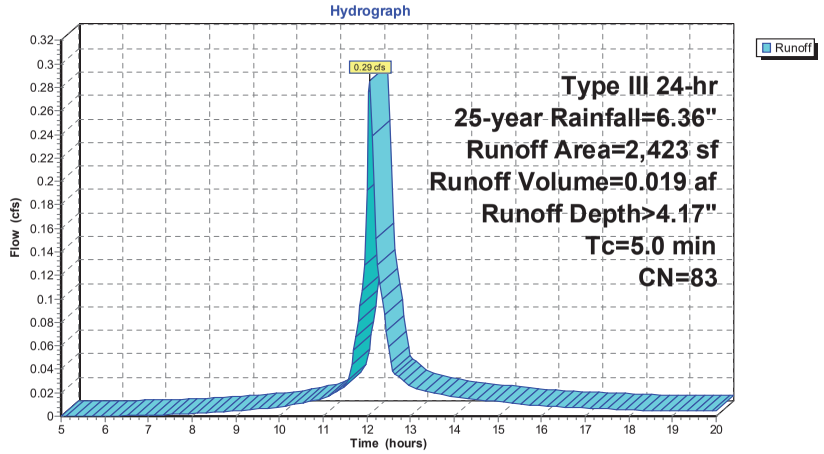
Runoff = 0.29 cfs @ 12.07 hrs, Volume= 0.019 af, Depth> 4.17"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.36"

	Area (sf)	CN	Description
	1,563	74	>75% Grass cover, Good, HSG C
	399	98	Unconnected pavement, HSG C
*	461	98	Stormwater Basin
	2,423	83	Weighted Average
	1,563		64.51% Pervious Area
	860		35.49% Impervious Area
	399		46.40% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-2: BMP 1 Basin 1 Forebay



Summary for Subcatchment C-3: BMP 1 Basin 1 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

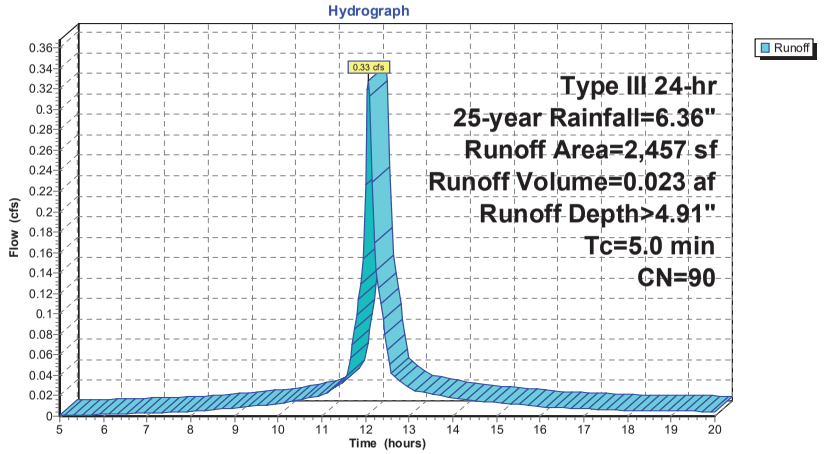
Runoff = 0.33 cfs @ 12.07 hrs, Volume= 0.023 af, Depth> 4.91"
Routed to Pond P2 : BMP 1 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.36"

	Area (sf)	CN	Description
	775	74	>75% Grass cover, Good, HSG C
	256	98	Unconnected pavement, HSG C
*	1,426	98	Stormwater Basin
	2,457	90	Weighted Average
	775		31.54% Pervious Area
	1,682		68.46% Impervious Area
	256		15.22% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-3: BMP 1 Basin 1 Direct Flow



Summary for Subcatchment C-4: BMP 1 Basin 2 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

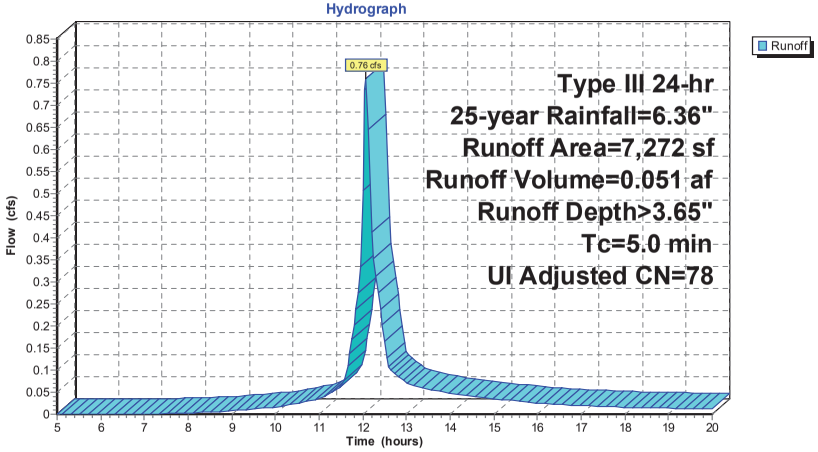
Runoff = 0.76 cfs @ 12.08 hrs, Volume= 0.051 af, Depth> 3.65"
Routed to Pond P3 : BMP 1 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.36"

	Area (sf)	CN	Adj	Description
	5,430	74		>75% Grass cover, Good, HSG C
	1,225	98		Unconnected pavement, HSG C
*	617	98		Stormwater Basin
	7,272	80	78	Weighted Average, UI Adjusted
	5,430			74.67% Pervious Area
	1,842			25.33% Impervious Area
	1,225			66.50% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-4: BMP 1 Basin 2 Direct Flow



Summary for Subcatchment C-5: BMP 2 Road

[49] Hint: Tc<2dt may require smaller dt

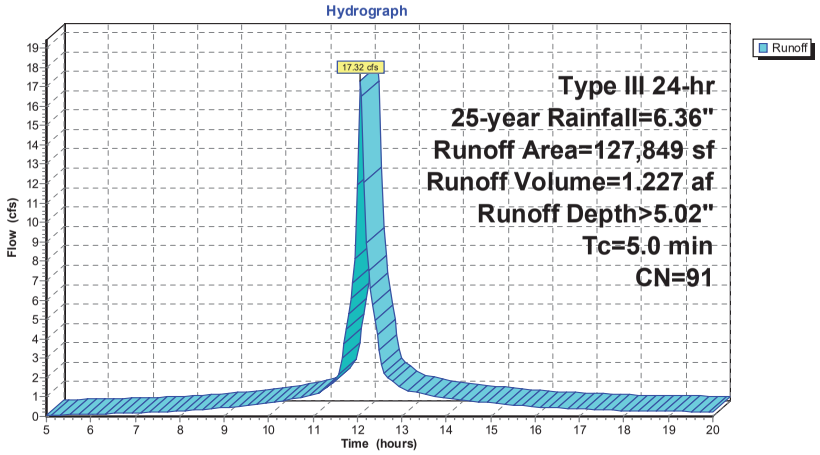
Runoff = 17.32 cfs @ 12.07 hrs, Volume= 1.227 af, Depth> 5.02"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.36"

Area (sf)	CN	Description
35,874	74	>75% Grass cover, Good, HSG C
91,975	98	Unconnected pavement, HSG C
127,849	91	Weighted Average
35,874		28.06% Pervious Area
91,975		71.94% Impervious Area
91,975		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-5: BMP 2 Road



Summary for Subcatchment C-6: BMP 2 Basin 1

[49] Hint: Tc<2dt may require smaller dt

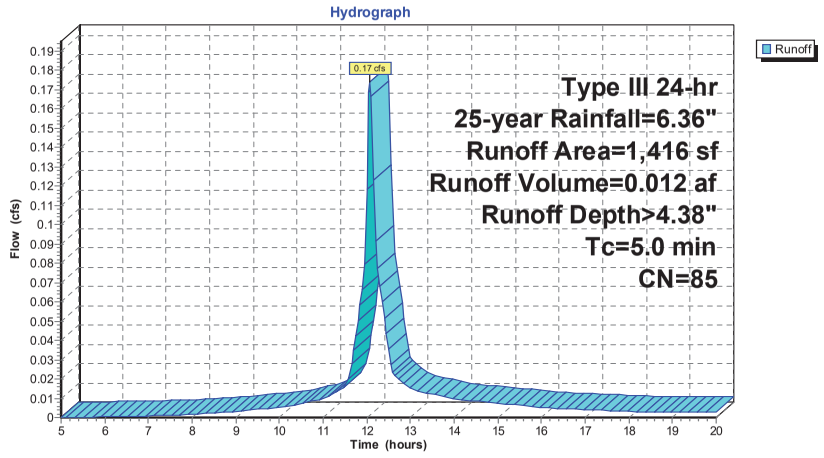
Runoff = 0.17 cfs @ 12.07 hrs, Volume= 0.012 af, Depth> 4.38"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.36"

	Area (sf)	CN	Description
	793	74	>75% Grass cover, Good, HSG C
*	623	98	Stormwater Basin
	1,416	85	Weighted Average
	793		56.00% Pervious Area
	623		44.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-6: BMP 2 Basin 1



Summary for Subcatchment C-7: BMP 2 Basin 2

[49] Hint: Tc<2dt may require smaller dt

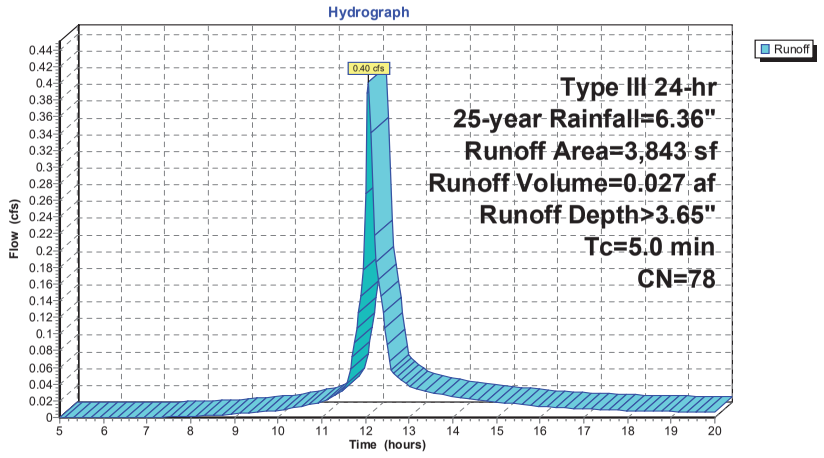
Runoff = 0.40 cfs @ 12.08 hrs, Volume= 0.027 af, Depth> 3.65"
Routed to Pond P5 : BMP 2 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.36"

	Area (sf)	CN	Description
	3,282	74	>75% Grass cover, Good, HSG C
*	561	98	Stormwater Basin
	3,843	78	Weighted Average
	3,282		85.40% Pervious Area
	561		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-7: BMP 2 Basin 2



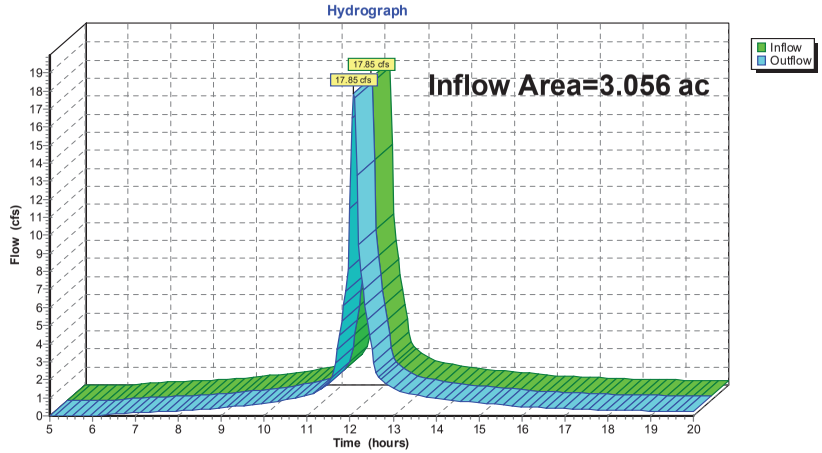
Summary for Reach DP-2: Existing Swale

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.056 ac, 69.99% Impervious, Inflow Depth > 4.89" for 25-year event
Inflow = 17.85 cfs @ 12.09 hrs, Volume= 1.245 af
Outflow = 17.85 cfs @ 12.09 hrs, Volume= 1.245 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Existing Swale



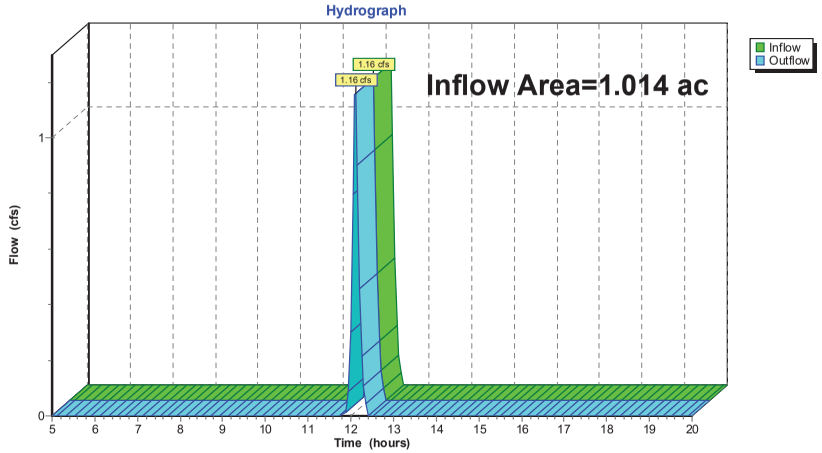
Summary for Reach DP1-A: Off-Site Sheet Flow

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.014 ac, 58.29% Impervious, Inflow Depth = 0.20" for 25-year event
Inflow = 1.16 cfs @ 12.10 hrs, Volume= 0.017 af
Outflow = 1.16 cfs @ 12.10 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-A: Off-Site Sheet Flow



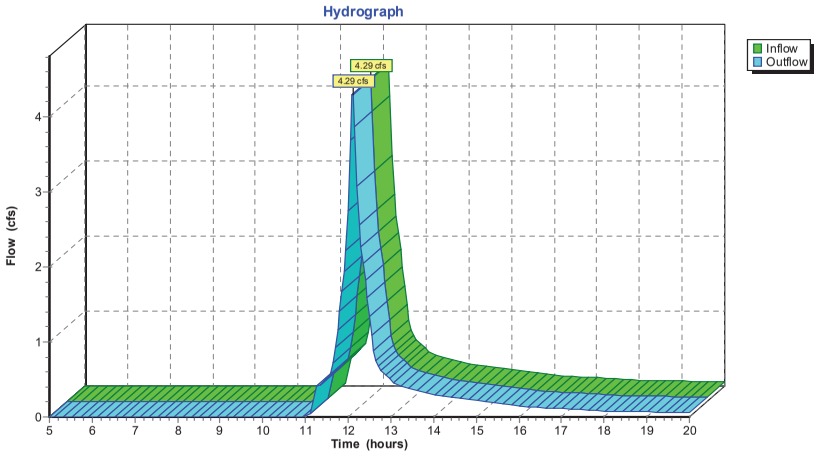
Summary for Reach DP1-B: Closed Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 4.29 cfs @ 12.10 hrs, Volume= 0.303 af
Outflow = 4.29 cfs @ 12.10 hrs, Volume= 0.303 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-B: Closed Drainage System



Summary for Pond P1: BMP 1 Basin 1 Forebay

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.791 ac, 64.53% Impervious, Inflow Depth > 4.86" for 25-year event
Inflow = 4.56 cfs @ 12.07 hrs, Volume= 0.320 af
Outflow = 4.54 cfs @ 12.08 hrs, Volume= 0.315 af, Atten= 1%, Lag= 0.5 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 4.53 cfs @ 12.08 hrs, Volume= 0.310 af
Routed to Pond P2 : BMP 1 Basin 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.84' @ 12.08 hrs Surf.Area= 421 sf Storage= 328 cf

Plug-Flow detention time= 13.0 min calculated for 0.314 af (98% of inflow)
Center-of-Mass det. time= 6.4 min (761.4 - 755.0)

Volume	Invert	Avail.Storage	Storage Description
#1	432.50'	398 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

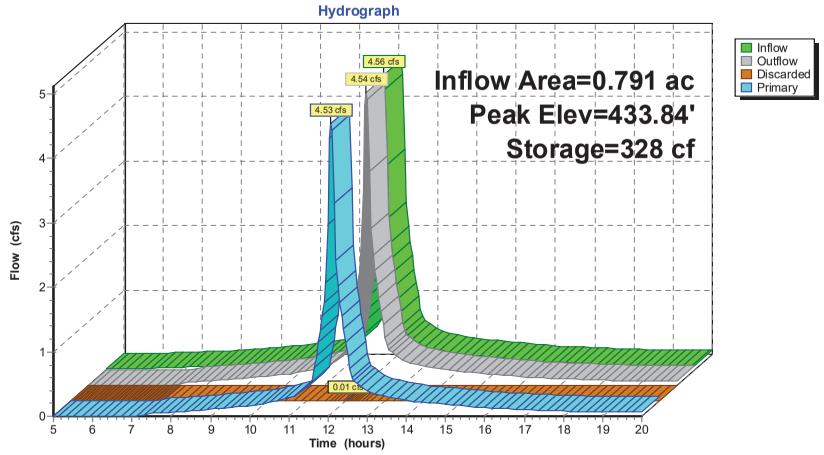
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
432.50	42	0	0
433.00	209	63	63
434.00	461	335	398

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	432.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=433.83' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=4.38 cfs @ 12.08 hrs HW=433.83' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 4.38 cfs @ 1.28 fps)

Pond P1: BMP 1 Basin 1 Forebay



Summary for Pond P2: BMP 1 Basin 1

[81] Warning: Exceeded Pond P1 by 0.13' @ 12.15 hrs

Inflow Area = 0.847 ac, 64.79% Impervious, Inflow Depth > 4.72" for 25-year event
Inflow = 4.86 cfs @ 12.08 hrs, Volume= 0.333 af
Outflow = 4.74 cfs @ 12.10 hrs, Volume= 0.295 af, Atten= 2%, Lag= 1.4 min
Discarded = 0.02 cfs @ 12.10 hrs, Volume= 0.014 af
Primary = 4.73 cfs @ 12.10 hrs, Volume= 0.281 af
Routed to Pond P3 : BMP 1 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.96' @ 12.10 hrs Surf.Area= 1,408 sf Storage= 2,172 cf

Plug-Flow detention time= 61.6 min calculated for 0.295 af (89% of inflow)
Center-of-Mass det. time= 25.6 min (786.3 - 760.7)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	2,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

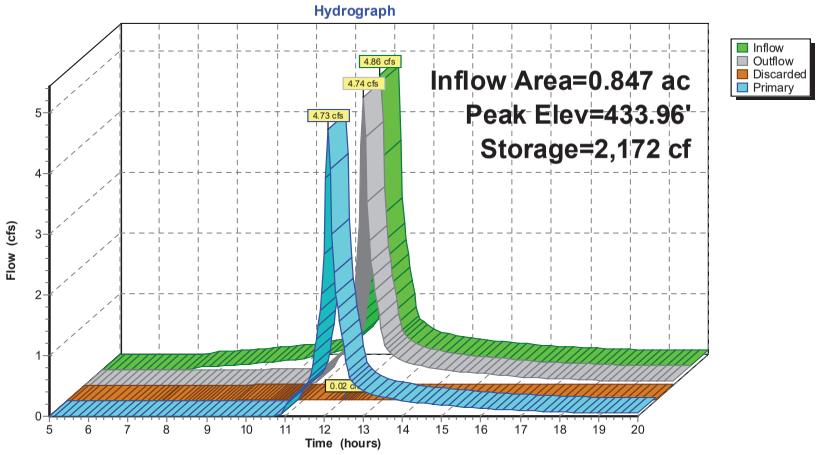
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	416	0	0
432.00	586	251	251
433.00	974	780	1,031
434.00	1,427	1,201	2,231
434.50	1,594	755	2,986

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**7.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	431.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.10 hrs HW=433.96' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=4.69 cfs @ 12.10 hrs HW=433.96' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 4.69 cfs @ 1.65 fps)

Pond P2: BMP 1 Basin 1



Summary for Pond P3: BMP 1 Basin 2

Inflow Area = 1.014 ac, 58.29% Impervious, Inflow Depth > 3.93" for 25-year event
Inflow = 5.46 cfs @ 12.10 hrs, Volume= 0.332 af
Outflow = 5.46 cfs @ 12.10 hrs, Volume= 0.324 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.004 af
Primary = 1.16 cfs @ 12.10 hrs, Volume= 0.017 af
Routed to Reach DP1-A : Off-Site Sheet Flow
Secondary = 4.29 cfs @ 12.10 hrs, Volume= 0.303 af
Routed to Reach DP1-B : Closed Drainage System

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 421.65' @ 12.10 hrs Surf.Area= 509 sf Storage= 472 cf

Plug-Flow detention time= 12.2 min calculated for 0.323 af (97% of inflow)
Center-of-Mass det. time= 4.0 min (786.9 - 782.9)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	1,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	103	0	0
421.00	308	206	206
422.00	616	462	668
422.50	726	336	1,003

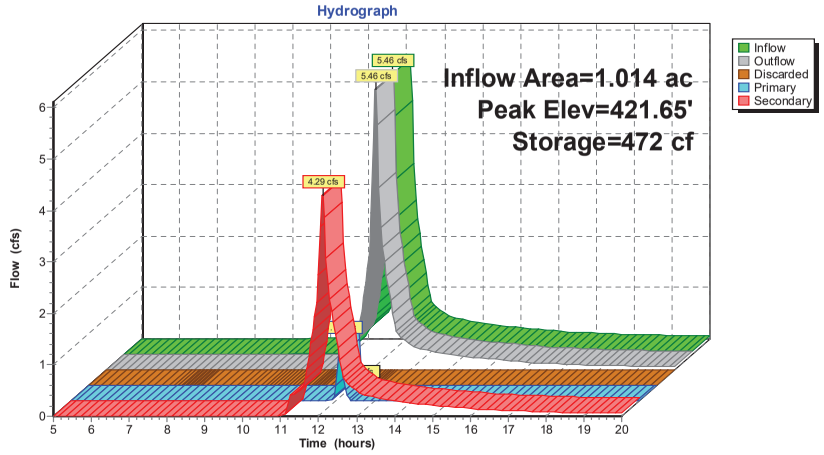
Device	Routing	Invert	Outlet Devices
#1	Primary	421.50'	**8.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Secondary	421.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	420.00'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=421.65' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.13 cfs @ 12.10 hrs HW=421.65' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.13 cfs @ 0.94 fps)

Secondary OutFlow Max=4.25 cfs @ 12.10 hrs HW=421.65' (Free Discharge)
↑**2=Orifice/Grate** (Weir Controls 4.25 cfs @ 1.93 fps)

Pond P3: BMP 1 Basin 2



Summary for Pond P4: BMP 2 Basin 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.968 ac, 71.63% Impervious, Inflow Depth > 5.01" for 25-year event
Inflow = 17.49 cfs @ 12.07 hrs, Volume= 1.239 af
Outflow = 17.40 cfs @ 12.08 hrs, Volume= 1.233 af, Atten= 1%, Lag= 0.5 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 17.39 cfs @ 12.08 hrs, Volume= 1.227 af
Routed to Pond P5 : BMP 2 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 292.85' @ 12.08 hrs Surf.Area= 559 sf Storage= 593 cf

Plug-Flow detention time= 4.8 min calculated for 1.233 af (99% of inflow)
Center-of-Mass det. time= 2.5 min (754.0 - 751.5)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	1,012 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

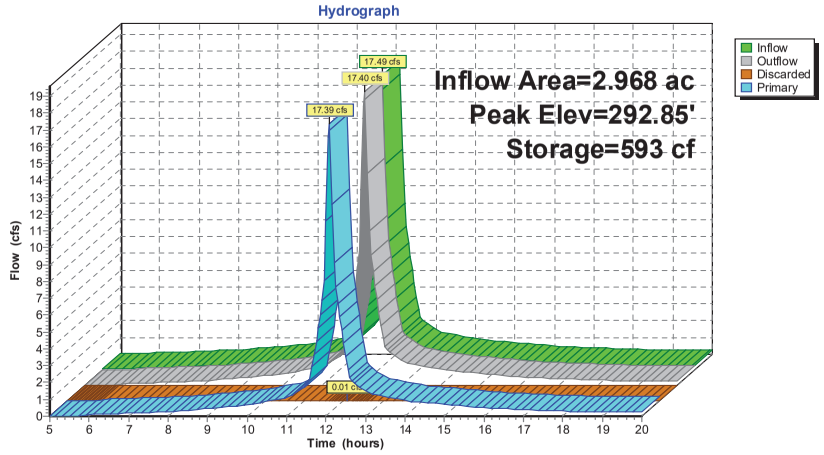
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.00	110	0	0
292.00	325	218	218
293.00	600	463	680
293.50	729	332	1,012

Device	Routing	Invert	Outlet Devices
#1	Primary	292.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	291.00'	**0.510 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=292.83' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=16.81 cfs @ 12.08 hrs HW=292.83' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 16.81 cfs @ 2.30 fps)

Pond P4: BMP 2 Basin 1



Summary for Pond P5: BMP 2 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.056 ac, 69.99% Impervious, Inflow Depth > 4.93" for 25-year event
Inflow = 17.79 cfs @ 12.08 hrs, Volume= 1.254 af
Outflow = 17.85 cfs @ 12.09 hrs, Volume= 1.250 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.004 af
Primary = 17.85 cfs @ 12.09 hrs, Volume= 1.245 af
Routed to Reach DP-2 : Existing Swale

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 283.86' @ 12.08 hrs Surf.Area= 522 sf Storage= 483 cf

Plug-Flow detention time= 3.1 min calculated for 1.246 af (99% of inflow)
Center-of-Mass det. time= 1.6 min (756.2 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1	282.00'	867 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

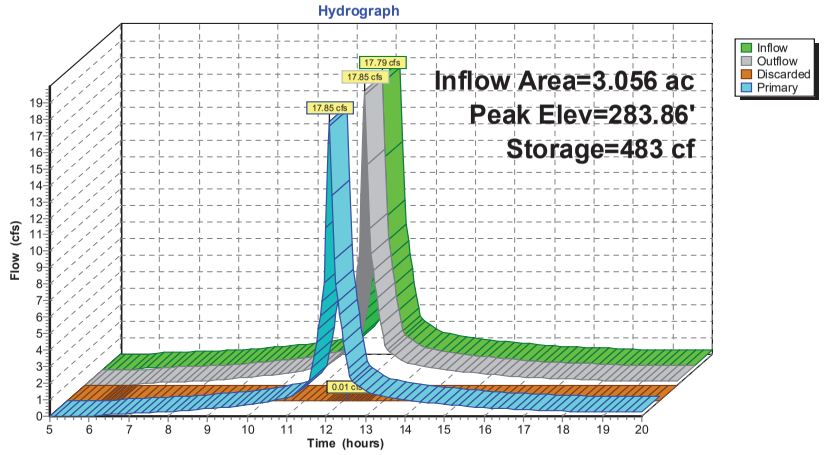
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
282.00	25	0	0
283.00	263	144	144
284.00	563	413	557
284.50	675	310	867

Device	Routing	Invert	Outlet Devices
#1	Discarded	282.00'	**0.510 in/hr Exfiltration over Surface area**
#2	Primary	283.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=283.85' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=17.28 cfs @ 12.09 hrs HW=283.85' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 17.28 cfs @ 2.32 fps)

Pond P5: BMP 2 Basin 2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentC-1: BMP 1 Road Runoff Area=32,025 sf 66.72% Impervious Runoff Depth>6.55"
Tc=5.0 min CN=90 Runoff=5.62 cfs 0.402 af

SubcatchmentC-2: BMP 1 Basin 1 Forebay Runoff Area=2,423 sf 35.49% Impervious Runoff Depth>5.77"
Tc=5.0 min CN=83 Runoff=0.39 cfs 0.027 af

SubcatchmentC-3: BMP 1 Basin 1 Direct Runoff Area=2,457 sf 68.46% Impervious Runoff Depth>6.55"
Tc=5.0 min CN=90 Runoff=0.43 cfs 0.031 af

SubcatchmentC-4: BMP 1 Basin 2 Direct Runoff Area=7,272 sf 25.33% Impervious Runoff Depth>5.19"
Tc=5.0 min UI Adjusted CN=78 Runoff=1.07 cfs 0.072 af

SubcatchmentC-5: BMP 2 Road Runoff Area=127,849 sf 71.94% Impervious Runoff Depth>6.66"
Tc=5.0 min CN=91 Runoff=22.66 cfs 1.629 af

SubcatchmentC-6: BMP 2 Basin 1 Runoff Area=1,416 sf 44.00% Impervious Runoff Depth>6.00"
Tc=5.0 min CN=85 Runoff=0.23 cfs 0.016 af

SubcatchmentC-7: BMP 2 Basin 2 Runoff Area=3,843 sf 14.60% Impervious Runoff Depth>5.19"
Tc=5.0 min CN=78 Runoff=0.57 cfs 0.038 af

Reach DP-2: Existing Swale Inflow=23.39 cfs 1.663 af
Outflow=23.39 cfs 1.663 af

Reach DP1-A: Off-Site Sheet Flow Inflow=1.89 cfs 0.033 af
Outflow=1.89 cfs 0.033 af

Reach DP1-B: Closed Drainage System Inflow=5.40 cfs 0.422 af
Outflow=5.40 cfs 0.422 af

Pond P1: BMP 1 Basin 1 Forebay Peak Elev=433.90' Storage=351 cf Inflow=6.01 cfs 0.428 af
Discarded=0.01 cfs 0.005 af Primary=5.97 cfs 0.418 af Outflow=5.98 cfs 0.423 af

Pond P2: BMP 1 Basin 1 Peak Elev=434.04' Storage=2,285 cf Inflow=6.40 cfs 0.449 af
Discarded=0.02 cfs 0.015 af Primary=6.26 cfs 0.395 af Outflow=6.28 cfs 0.411 af

Pond P3: BMP 1 Basin 2 Peak Elev=421.71' Storage=502 cf Inflow=7.29 cfs 0.468 af
Discarded=0.01 cfs 0.005 af Primary=1.89 cfs 0.033 af Secondary=5.40 cfs 0.422 af Outflow=7.29 cfs 0.460 af

Pond P4: BMP 2 Basin 1 Peak Elev=293.00' Storage=679 cf Inflow=22.90 cfs 1.645 af
Discarded=0.01 cfs 0.006 af Primary=22.75 cfs 1.633 af Outflow=22.76 cfs 1.639 af

Pond P5: BMP 2 Basin 2 Peak Elev=284.02' Storage=566 cf Inflow=23.32 cfs 1.672 af
Discarded=0.01 cfs 0.005 af Primary=23.39 cfs 1.663 af Outflow=23.40 cfs 1.667 af

Total Runoff Area = 4.070 ac Runoff Volume = 2.215 af Average Runoff Depth = 6.53"
32.93% Pervious = 1.340 ac 67.07% Impervious = 2.730 ac

Summary for Subcatchment C-1: BMP 1 Road

[49] Hint: Tc<2dt may require smaller dt

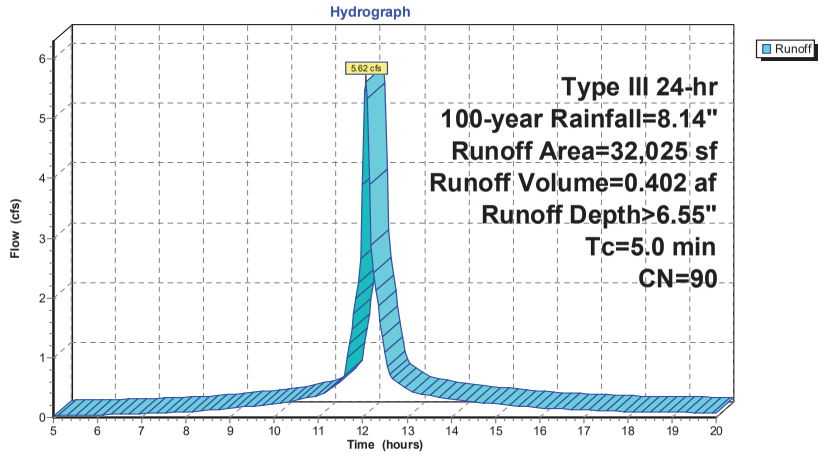
Runoff = 5.62 cfs @ 12.07 hrs, Volume= 0.402 af, Depth> 6.55"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

Area (sf)	CN	Description
10,657	74	>75% Grass cover, Good, HSG C
21,368	98	Unconnected pavement, HSG C
32,025	90	Weighted Average
10,657		33.28% Pervious Area
21,368		66.72% Impervious Area
21,368		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-1: BMP 1 Road



Summary for Subcatchment C-2: BMP 1 Basin 1 Forebay

[49] Hint: Tc<2dt may require smaller dt

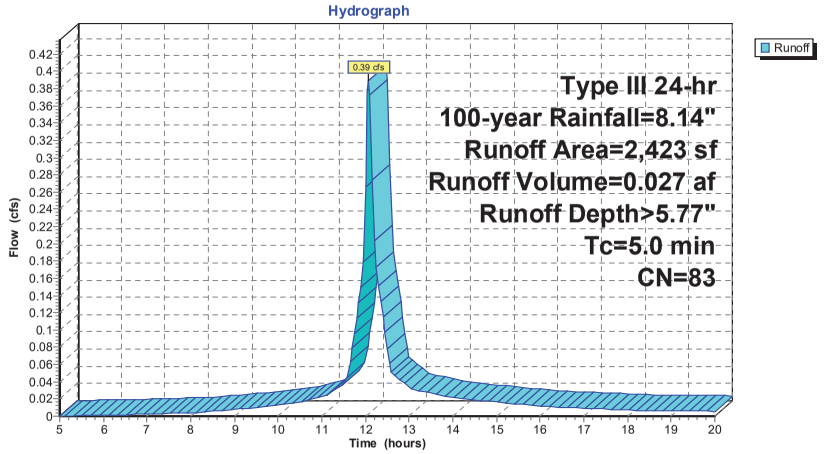
Runoff = 0.39 cfs @ 12.07 hrs, Volume= 0.027 af, Depth> 5.77"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Description
	1,563	74	>75% Grass cover, Good, HSG C
	399	98	Unconnected pavement, HSG C
*	461	98	Stormwater Basin
	2,423	83	Weighted Average
	1,563		64.51% Pervious Area
	860		35.49% Impervious Area
	399		46.40% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-2: BMP 1 Basin 1 Forebay



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Summary for Subcatchment C-3: BMP 1 Basin 1 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

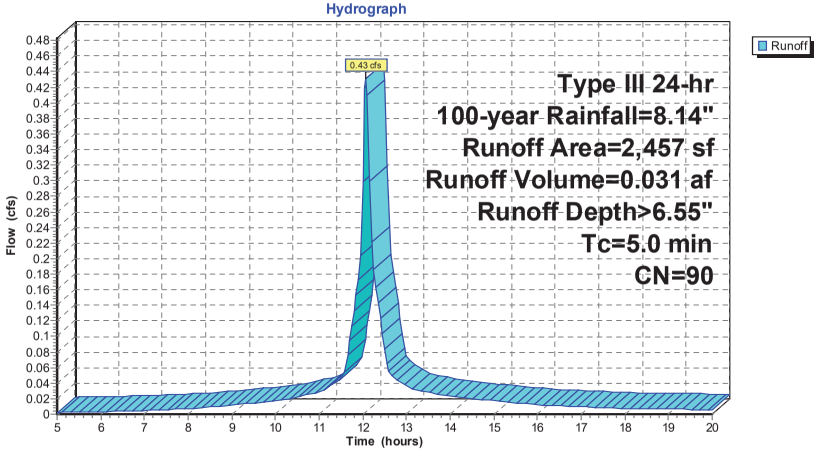
Runoff = 0.43 cfs @ 12.07 hrs, Volume= 0.031 af, Depth> 6.55"
Routed to Pond P2 : BMP 1 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Description
	775	74	>75% Grass cover, Good, HSG C
	256	98	Unconnected pavement, HSG C
*	1,426	98	Stormwater Basin
	2,457	90	Weighted Average
	775		31.54% Pervious Area
	1,682		68.46% Impervious Area
	256		15.22% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-3: BMP 1 Basin 1 Direct Flow



Summary for Subcatchment C-4: BMP 1 Basin 2 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

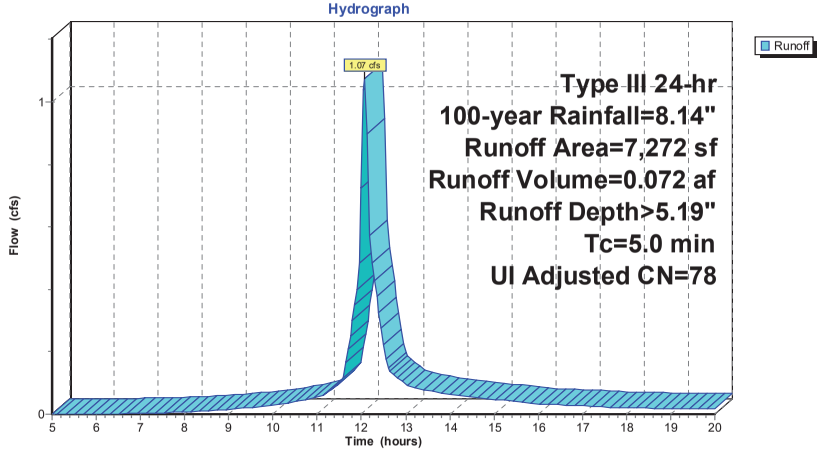
Runoff = 1.07 cfs @ 12.07 hrs, Volume= 0.072 af, Depth> 5.19"
Routed to Pond P3 : BMP 1 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Adj	Description
	5,430	74		>75% Grass cover, Good, HSG C
	1,225	98		Unconnected pavement, HSG C
*	617	98		Stormwater Basin
	7,272	80	78	Weighted Average, UI Adjusted
	5,430			74.67% Pervious Area
	1,842			25.33% Impervious Area
	1,225			66.50% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-4: BMP 1 Basin 2 Direct Flow



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Summary for Subcatchment C-5: BMP 2 Road

[49] Hint: Tc<2dt may require smaller dt

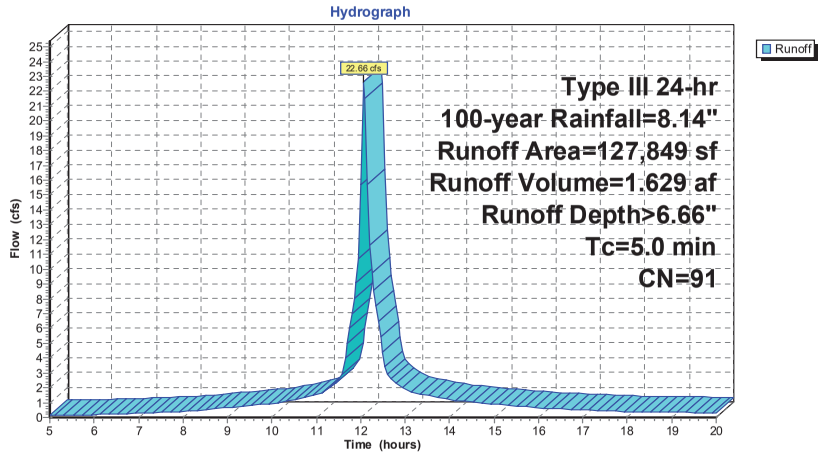
Runoff = 22.66 cfs @ 12.07 hrs, Volume= 1.629 af, Depth> 6.66"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

Area (sf)	CN	Description
35,874	74	>75% Grass cover, Good, HSG C
91,975	98	Unconnected pavement, HSG C
127,849	91	Weighted Average
35,874		28.06% Pervious Area
91,975		71.94% Impervious Area
91,975		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-5: BMP 2 Road



Summary for Subcatchment C-6: BMP 2 Basin 1

[49] Hint: Tc<2dt may require smaller dt

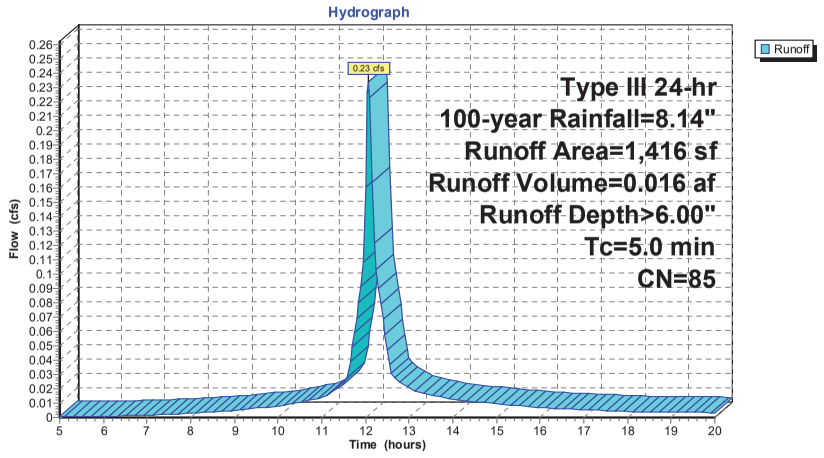
Runoff = 0.23 cfs @ 12.07 hrs, Volume= 0.016 af, Depth> 6.00"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Description
	793	74	>75% Grass cover, Good, HSG C
*	623	98	Stormwater Basin
	1,416	85	Weighted Average
	793		56.00% Pervious Area
	623		44.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-6: BMP 2 Basin 1



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Summary for Subcatchment C-7: BMP 2 Basin 2

[49] Hint: Tc<2dt may require smaller dt

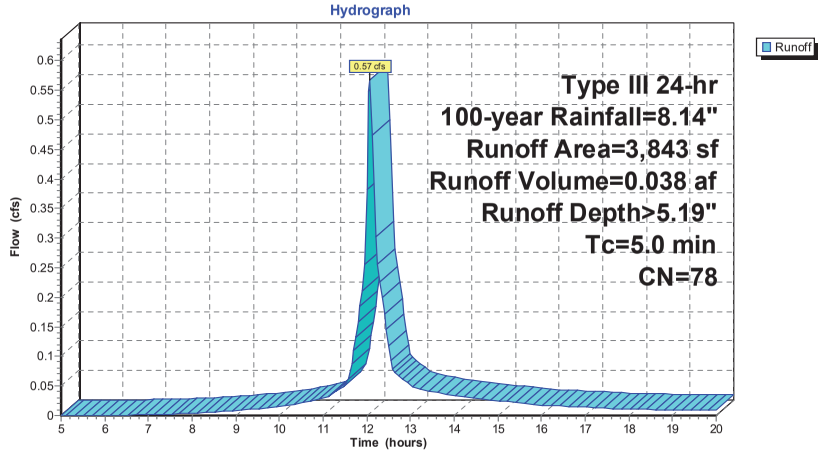
Runoff = 0.57 cfs @ 12.07 hrs, Volume= 0.038 af, Depth> 5.19"
Routed to Pond P5 : BMP 2 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Description
	3,282	74	>75% Grass cover, Good, HSG C
*	561	98	Stormwater Basin
	3,843	78	Weighted Average
	3,282		85.40% Pervious Area
	561		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-7: BMP 2 Basin 2



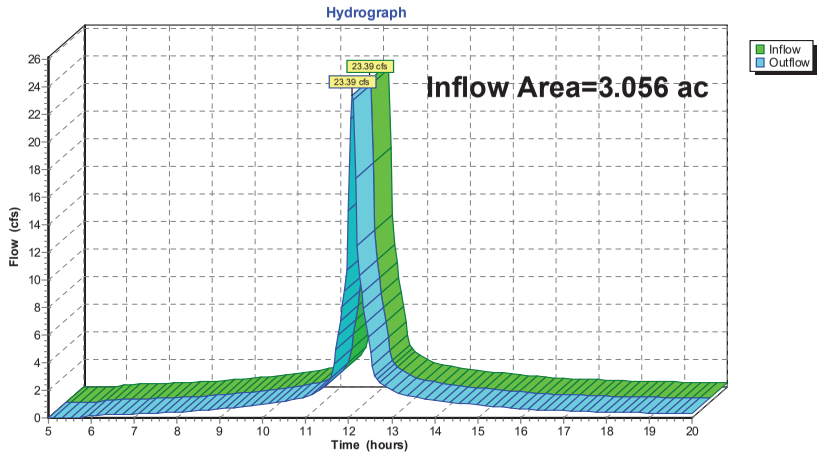
Summary for Reach DP-2: Existing Swale

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.056 ac, 69.99% Impervious, Inflow Depth > 6.53" for 100-year event
Inflow = 23.39 cfs @ 12.08 hrs, Volume= 1.663 af
Outflow = 23.39 cfs @ 12.08 hrs, Volume= 1.663 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Existing Swale



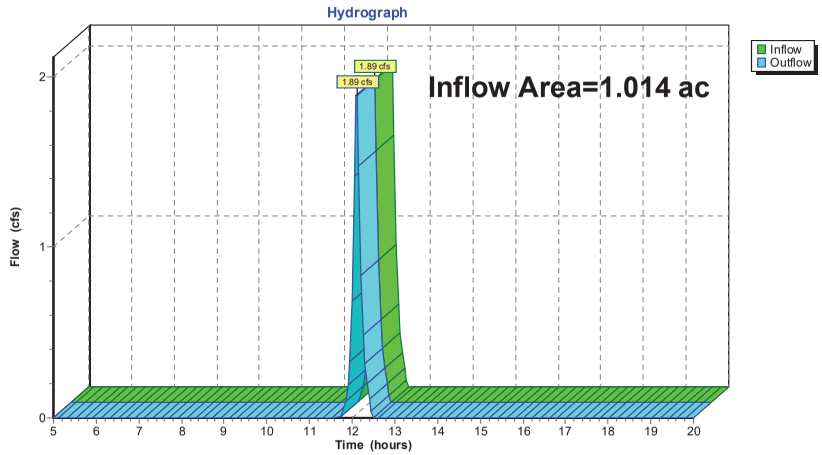
Summary for Reach DP1-A: Off-Site Sheet Flow

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.014 ac, 58.29% Impervious, Inflow Depth = 0.40" for 100-year event
Inflow = 1.89 cfs @ 12.10 hrs, Volume= 0.033 af
Outflow = 1.89 cfs @ 12.10 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-A: Off-Site Sheet Flow



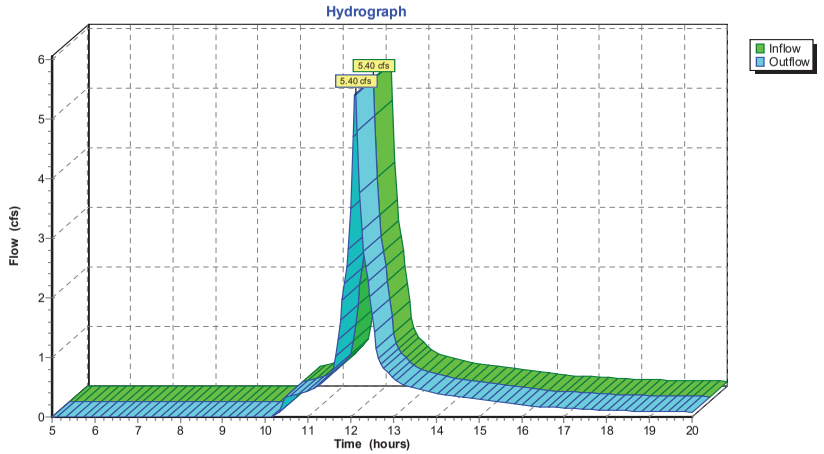
Summary for Reach DP1-B: Closed Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 5.40 cfs @ 12.10 hrs, Volume= 0.422 af
Outflow = 5.40 cfs @ 12.10 hrs, Volume= 0.422 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-B: Closed Drainage System



Summary for Pond P1: BMP 1 Basin 1 Forebay

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.791 ac, 64.53% Impervious, Inflow Depth > 6.50" for 100-year event
Inflow = 6.01 cfs @ 12.07 hrs, Volume= 0.428 af
Outflow = 5.98 cfs @ 12.08 hrs, Volume= 0.423 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 5.97 cfs @ 12.08 hrs, Volume= 0.418 af
Routed to Pond P2 : BMP 1 Basin 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.90' @ 12.08 hrs Surf.Area= 435 sf Storage= 351 cf

Plug-Flow detention time= 10.3 min calculated for 0.422 af (98% of inflow)
Center-of-Mass det. time= 5.2 min (754.9 - 749.6)

Volume	Invert	Avail.Storage	Storage Description
#1	432.50'	398 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

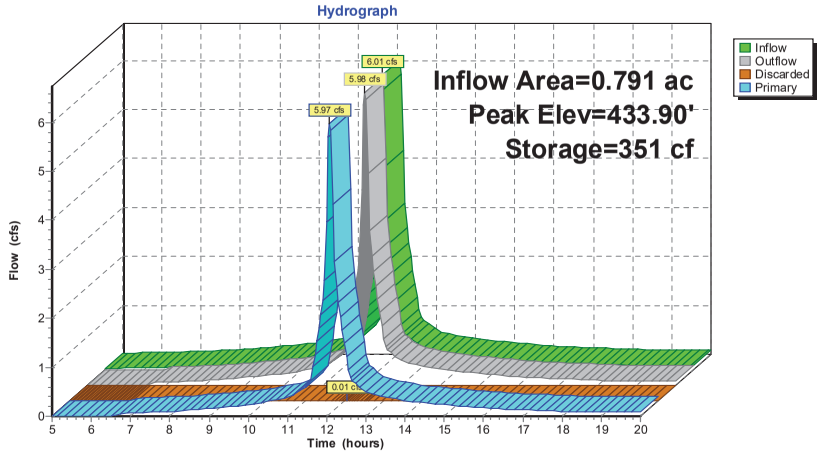
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
432.50	42	0	0
433.00	209	63	63
434.00	461	335	398

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	432.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=433.89' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=5.77 cfs @ 12.08 hrs HW=433.89' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 5.77 cfs @ 1.42 fps)

Pond P1: BMP 1 Basin 1 Forebay



Summary for Pond P2: BMP 1 Basin 1

[81] Warning: Exceeded Pond P1 by 0.16' @ 12.15 hrs

Inflow Area = 0.847 ac, 64.79% Impervious, Inflow Depth > 6.36" for 100-year event
Inflow = 6.40 cfs @ 12.08 hrs, Volume= 0.449 af
Outflow = 6.28 cfs @ 12.10 hrs, Volume= 0.411 af, Atten= 2%, Lag= 1.3 min
Discarded = 0.02 cfs @ 12.10 hrs, Volume= 0.015 af
Primary = 6.26 cfs @ 12.10 hrs, Volume= 0.395 af
Routed to Pond P3 : BMP 1 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 434.04' @ 12.10 hrs Surf.Area= 1,440 sf Storage= 2,285 cf

Plug-Flow detention time= 51.7 min calculated for 0.409 af (91% of inflow)
Center-of-Mass det. time= 23.1 min (777.4 - 754.3)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	2,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

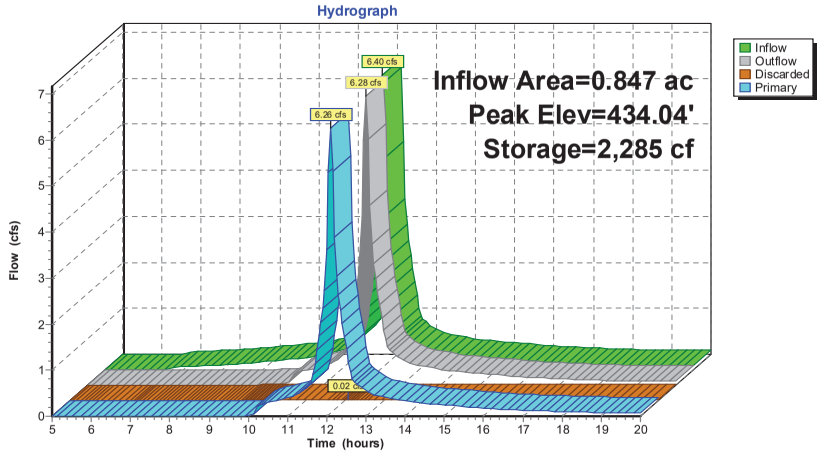
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	416	0	0
432.00	586	251	251
433.00	974	780	1,031
434.00	1,427	1,201	2,231
434.50	1,594	755	2,986

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**7.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	431.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.10 hrs HW=434.04' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=6.25 cfs @ 12.10 hrs HW=434.04' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 6.25 cfs @ 1.83 fps)

Pond P2: BMP 1 Basin 1



Summary for Pond P3: BMP 1 Basin 2

Inflow Area = 1.014 ac, 58.29% Impervious, Inflow Depth > 5.53" for 100-year event
Inflow = 7.29 cfs @ 12.10 hrs, Volume= 0.468 af
Outflow = 7.29 cfs @ 12.10 hrs, Volume= 0.460 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.005 af
Primary = 1.89 cfs @ 12.10 hrs, Volume= 0.033 af
Routed to Reach DP1-A : Off-Site Sheet Flow
Secondary = 5.40 cfs @ 12.10 hrs, Volume= 0.422 af
Routed to Reach DP1-B : Closed Drainage System

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 421.71' @ 12.10 hrs Surf.Area= 527 sf Storage= 502 cf

Plug-Flow detention time= 9.9 min calculated for 0.460 af (98% of inflow)
Center-of-Mass det. time= 3.6 min (778.8 - 775.2)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	1,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	103	0	0
421.00	308	206	206
422.00	616	462	668
422.50	726	336	1,003

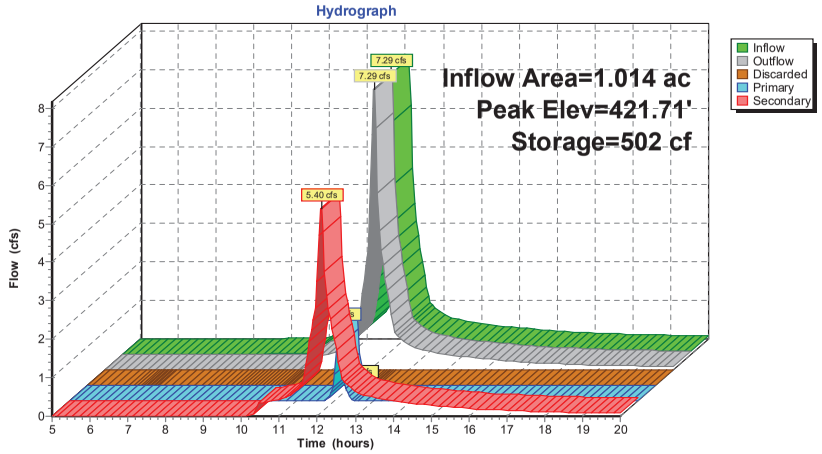
Device	Routing	Invert	Outlet Devices
#1	Primary	421.50'	**8.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Secondary	421.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	420.00'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=421.71' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.87 cfs @ 12.10 hrs HW=421.71' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.87 cfs @ 1.12 fps)

Secondary OutFlow Max=5.38 cfs @ 12.10 hrs HW=421.71' (Free Discharge)
↑**2=Orifice/Grate** (Weir Controls 5.38 cfs @ 2.09 fps)

Pond P3: BMP 1 Basin 2



Summary for Pond P4: BMP 2 Basin 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.968 ac, 71.63% Impervious, Inflow Depth > 6.65" for 100-year event
Inflow = 22.90 cfs @ 12.07 hrs, Volume= 1.645 af
Outflow = 22.76 cfs @ 12.08 hrs, Volume= 1.639 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.006 af
Primary = 22.75 cfs @ 12.08 hrs, Volume= 1.633 af
Routed to Pond P5 : BMP 2 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 293.00' @ 12.08 hrs Surf.Area= 600 sf Storage= 679 cf

Plug-Flow detention time= 3.8 min calculated for 1.633 af (99% of inflow)
Center-of-Mass det. time= 2.0 min (748.6 - 746.7)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	1,012 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

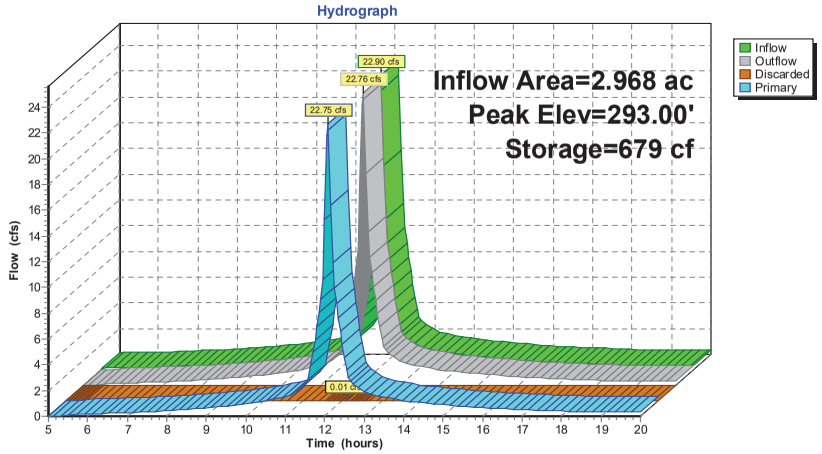
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.00	110	0	0
292.00	325	218	218
293.00	600	463	680
293.50	729	332	1,012

Device	Routing	Invert	Outlet Devices
#1	Primary	292.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	291.00'	**0.510 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=292.98' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=21.99 cfs @ 12.08 hrs HW=292.98' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 21.99 cfs @ 2.51 fps)

Pond P4: BMP 2 Basin 1



Summary for Pond P5: BMP 2 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.056 ac, 69.99% Impervious, Inflow Depth > 6.56" for 100-year event
Inflow = 23.32 cfs @ 12.08 hrs, Volume= 1.672 af
Outflow = 23.40 cfs @ 12.08 hrs, Volume= 1.667 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 23.39 cfs @ 12.08 hrs, Volume= 1.663 af
Routed to Reach DP-2 : Existing Swale

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 284.02' @ 12.08 hrs Surf.Area= 566 sf Storage= 566 cf

Plug-Flow detention time= 2.5 min calculated for 1.667 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (750.6 - 749.2)

Volume	Invert	Avail.Storage	Storage Description
#1	282.00'	867 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

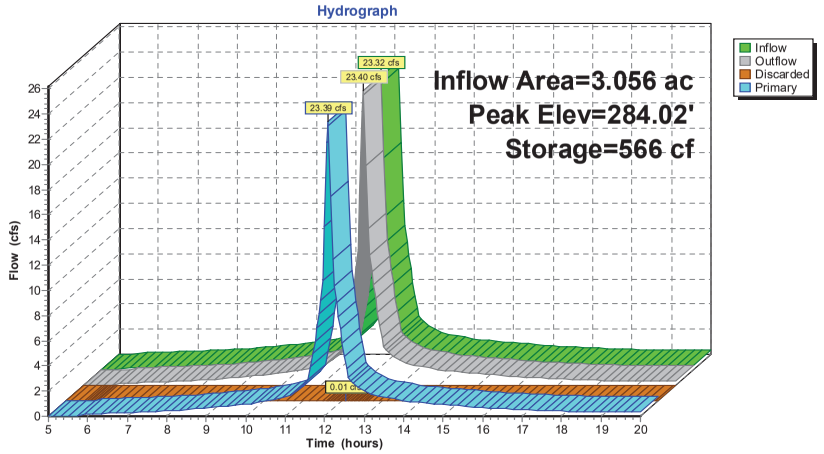
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
282.00	25	0	0
283.00	263	144	144
284.00	563	413	557
284.50	675	310	867

Device	Routing	Invert	Outlet Devices
#1	Discarded	282.00'	**0.510 in/hr Exfiltration over Surface area**
#2	Primary	283.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=283.99' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=22.64 cfs @ 12.08 hrs HW=283.99' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 22.64 cfs @ 2.53 fps)

Pond P5: BMP 2 Basin 2



HNTB	The HNTB Companies	Done by: WS	Date	12/21/23	Job Number	70095
		Checked by: CTN	Date	12/21/23		

70095: Uxbridge Road, Hastings Street, Milford Street (Route 16), Mendon, MA: Project File No. 608491

STANDARD 3: RECHARGE VOLUME

BMP 1 - Basin 1

Required Recharge Volume Calculation

Hydrologic Soil Code	Impervious Area (sf)	Target Depth Factor (in.)	Required Recharge Volume (cf)	Basin Recharge Volume (cf)
B	21,919	0.35	639	1851

Recharge Volume Provided > Required Recharge Volume

Forebay Volume

Invert = 433.55	
Elevation (ft.)	**Area (sf)**
432.5	42
433.0	209
434.0	461

Avg. Area 237 sf
Depth 1.50 ft
Volume 216 cf

Basin Volume

Invert = 433.55	
Elevation (ft.)	**Area (sf)**
431.5	416
432.0	586
433.0	974
434.0	1427
434.5	1594

Avg. Area 851 sf
Depth 2.5 ft
Volume 1635 cf

Drawdown Calculation

Drawdown Time (hr.) = Recharge Volume Provided (cf) / Bottom Area (sf) * 12 in./ft. / Infiltration Rate (in./hr.)

Infiltration Rate (in./hr.) = 0.52

Drawdown Time (hr.) = 64

Drawdown Time (hr.) < 72 hrs.

STANDARD 4: WATER QUALITY VOLUME (MET TO MAXIMUM EXTENT PRACTICABLE)

Required Water Quality Volume Calculation

Required Water Quality Volume (cf) = Impervious Area Draining to the Infiltration Basin (sf) * 1 inch * 1 ft./12 in.

Impervious Area Draining to the Infiltration Basin (sf) = 21,919

Required Water Quality Volume (cf) = 1827 101%

Water Quality Volume Provided = 101% of the Required Water Quality Volume

HNTB	The HNTB Companies	Done by: WS	Date	12/21/23	Job Number	70095
		Checked by: CTN	Date	12/21/23		

70095: Uxbridge Road, Hastings Street, Milford Street (Route 16), Mendon, MA: Project File No. 608491

STANDARD 3: RECHARGE VOLUME

BMP 1 - Basin 2

Required Recharge Volume Calculation

Hydrologic Soil Code	Impervious Area (sf)	Target Depth Factor (in.)	Required Recharge Volume (cf)	Basin Recharge Volume (cf)
B	1225	0.35	36	312

Recharge Volume Provided > Required Recharge Volume

Basin Volume

Invert = 421.3	
Elevation (ft.)	**Area (sf)**
420.0	103
421.0	308
422.0	616
422.5	726

Avg. Area	438	sf
Depth	2.5	ft
Volume	312	cf

Drawdown Calculation

Drawdown Time (hr.) = Recharge Volume Provided (cf) / Bottom Area (sf) * 12 in./ft. / Infiltration Rate (in./hr.)

Infiltration Rate (in./hr.) = 0.52

Drawdown Time (hr.) = 70

Drawdown Time (hr.) < 72 hrs.

STANDARD 4: WATER QUALITY VOLUME (MET TO MAXIMUM EXTENT PRACTICABLE)

Required Water Quality Volume Calculation

Required Water Quality Volume (cf) = Impervious Area Draining to the Infiltration Basin (sf) * 1 inch * 1 ft./12 in.

Impervious Area Draining to the Infiltration Basin (sf) = 1225

Required Water Quality Volume (cf) = 102 306%

Water Quality Volume Provided = 306% of the Required Water Quality Volume

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

Version 1, Automated: Mar. 4, 2008

Location: BMP 1 (Pretreatment)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56

Total TSS Removal = 44%

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

Project: Uxbridge Road Mendon
Prepared By: WJS
Date: 12/20/2023

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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

Version 1, Automated: Mar. 4, 2008

Location: BMP 1 (Piped Flow)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
Grass Channel	0.50	0.15	0.08	0.08
Sediment Forebay	0.25	0.08	0.02	0.06
	0.00	0.06	0.00	0.06

Total TSS Removal = 94%

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

Project: Uxbridge Road Mendon
Prepared By: WJS
Date: 12/20/2023

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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

Version 1, Automated: Mar. 4, 2008

Location: BMP 1 (Sheet Flow to Top Basin)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	0.80	1.00	0.80	0.20
Grass Channel	0.50	0.20	0.10	0.10
Sediment Forebay	0.25	0.10	0.03	0.08
	0.00	0.08	0.00	0.08
	0.00	0.08	0.00	0.08

Total TSS Removal = 93%

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

Project: Uxbridge Road Mendon
Prepared By: WJS
Date: 12/20/2023

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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

Version 1, Automated: Mar. 4, 2008

Location: BMP 1 (Sheet Flow to Bottom Basin)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Grass Channel	0.50	1.00	0.50	0.50
Sediment Forebay	0.25	0.50	0.13	0.38
	0.00	0.38	0.00	0.38
	0.00	0.38	0.00	0.38
	0.00	0.38	0.00	0.38

Total TSS Removal = 63%

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

Project: Uxbridge Road Mendon
Prepared By: WJS
Date: 12/20/2023

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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Proposal No. 608491-131468

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

Version 1, Automated: Mar. 4, 2008

Location: BMP 2

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Grass Channel	0.50	0.75	0.38	0.38
	0.00	0.38	0.00	0.38
	0.00	0.38	0.00	0.38
	0.00	0.38	0.00	0.38

Total TSS Removal = 63%

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

Project: Uxbridge Road Mendon
Prepared By: WJS
Date: 12/20/2023

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Design of Grass Channels (Biofilter Swales) in accordance with MassDEP StormwaterManual

Grassed channels (or biofilter swales) are a Best Management Practice (BMP) defined by the MassDEP Stormwater Manual as a treatment system with removal mechanisms of sedimentation and gravity filtration. To receive TSS credit, a sediment forebay must be provided – and it is for both designed grass channels on the project. Additional pretreatment is also provided by deep sump catch basins collecting runoff from the roadway.

To comply with the guidelines within the MassDEP BMP Manual, the following guidelines must be achieved by the grass channel design:

- Velocity in channel during the water quality storm must be less than 1 foot per second.
- The water depth during the water quality event must not exceed 4 inches in the grass channel.
- The grass channel must be designed to convey both the 2-year and 10-year 24-hour storms
    - The runoff velocities for the 2-year storm must not cause erosion problems
    - Freeboard must be provided for the 10-year storm

These parameters were checked for the two designed grass channels on the project – the channel connecting Basin 1 and Basin 2 for BMP 1 (Grass Channel #1), and the channel connecting the small forebays at BMP 2 (Grass Channel #2). Each swale was analyzed using Flowmaster software, which generally solves for open channel flow using the Manning's Equation, and inputs from the HydroCAD for the BMP design, included in Appendix F.

Grass Channel #1

Grass channel #1 has the following design characteristics: bottom width of 5 feet, side slopes of 3:1, and a slope of 6.67%. A trapezoidal channel with these characteristics was analyzed in FlowMaster using inputs from the HydroCAD model for the Water Quality Storm (1 inch), 2-year storm (3.37 inches), and 10 year storm (5.21 inches) for the contributing drainage areas discharging from the upstream infiltration basin. Normal depth was solved, to match the flow input and swale characteristics to the flow depth in the swale during each design storm. The results are tabulated below:

Storm	Rainfall (inches)	Flow (cfs)	Normal Depth (feet)	Velocity (ft/s)
Water Quality	1	0.19	0.04	0.9
2-year	3.37	2.09	0.17	2.22
10-year	5.21	3.74	0.24	2.72

As demonstrated above: the velocity in the water quality storm is below 1 foot per second, the water depth is less than 4 inches in the WQ event (0.04 feet), the 2-year storm has a velocity below 4 feet per second (permissible velocity for channel with a slope between 5 and 10 percent), and 9 inches of freeboard is provided in the 10-year storm.

Grass Channel #2

Grass channel #1 has the following design characteristics: bottom width of 5 feet, side slopes of 3:1, and a slope of 8.33%. A trapezoidal channel with these characteristics was analyzed in FlowMaster using inputs from the HydroCAD model for the Water Quality Storm (1 inch), 2-

year storm (3.37 inches), and 10 year storm (5.21 inches) for the contributing drainage areas discharging from the upstream infiltration basin. Normal depth was solved, to match the flow input and swale characteristics to the flow depth in the swale during each design storm. The results are tabulated below:

Storm	Rainfall (inches)	Flow (cfs)	Normal Depth (feet)	Velocity (ft/s)
Water Quality	1	1.21	0.11	1.81
2-year	3.37	8.24	0.33	3.62
10-year	5.21	13.88	0.44	4.31

As demonstrated above:, the water depth is less than 4 inches in the WQ event (0.11feet), the 2-year storm has a velocity below 4 feet per second (permissible velocity for channel with a slope between 5 and 10 percent, and a minimum of 6 inches of freeboard is provided in the 10-year storm. While the velocity in the water quality storm is above 1 foot per second, additional velocity control measures (the forebays and checkdams) will help reduce the speed of flow, and provide water quality benefits for the channel.

Appendix E – USFWS Section 7/NLEB Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: December 07, 2023
Project code: 2024-0024175
Project Name: Resurfacing and Related Work on Route 16 (Uxbridge Road)

Subject: Consistency letter for the 'Resurfacing and Related Work on Route 16 (Uxbridge Road)' project under the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (NLEB).

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated December 07, 2023 to verify that the **Resurfacing and Related Work on Route 16 (Uxbridge Road)** (Proposed Action) may rely on the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action will have no effect on the endangered Indiana bat (*Myotis sodalis*) or the endangered northern long-eared bat (*Myotis septentrionalis*). If the Proposed Action is not modified, **no consultation is required for these two species.** If the Proposed Action is modified, or new information reveals that it may affect the Indiana bat and/or northern long-eared bat in a manner or to an extent not considered in the PBO, further review to conclude the requirements of ESA section 7(a)(2) may be required.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities:
If your initial bridge/culvert or structure assessment failed to detect Indiana bats and/or NLEBs use or occupancy, yet later detected prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office within 2 working days of the incident. In these instances, potential incidental take of Indiana bats and/or NLEBs may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species and/or designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please advise the lead Federal action agency accordingly.

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Candidate

PROJECT DESCRIPTION

The following project name and description was collected in IPaC as part of the endangered species review process.

NAME

Resurfacing and Related Work on Route 16 (Uxbridge Road)

DESCRIPTION

MassDOT is proposing to reconstruct and resurface Route 16 in Mendon, Massachusetts (Site). The Site consists of 1.9 miles of Route 16 between Taft Avenue and the Hopedale Town Line. In addition to the main project corridor, the following intersections and their roadway approaches constitute the project limits:

- Route 16 and Hartford Avenue West
- Route 16 and Millville Street
- Route 16 and Emerson Street / Washington Street
- Route 16 and Maple Street
- Route 16 and Main Street / North Avenue

Work will include pavement repair and resurfacing, bicycle and pedestrian accommodations including a shared-use path, and reconstruction of the signalized intersections to include new traffic signal equipment and address issues from previous road safety audits.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.11111545,-71.55009150872718,14z



DETERMINATION KEY RESULT

Based on the information you provided, you have determined that the Proposed Action will have no effect on the endangered Indiana bat and/or the endangered northern long-eared bat. Therefore, no consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required for these two species.

QUALIFICATION INTERVIEW

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the northern long-eared bat[1]?

   [1] See northern long-eared bat species profile

   Automatically answered
   Yes

3. [Semantic] Does your proposed action intersect an area where Indiana bats and northern long-eared bats are not likely to occur?

   Automatically answered
   Yes

DETERMINATION KEY DESCRIPTION: FHWA, FRA, FTA PROGRAMMATIC CONSULTATION FOR TRANSPORTATION PROJECTS AFFECTING NLEB OR INDIANA BAT

This key was last updated in IPaC on October 30, 2023. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the endangered **northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

IPAC USER CONTACT INFORMATION

Agency: Massachusetts Department of Transportation
Name: Jessica Rebholz
Address: 31 Saint James Avenue, Suite 400
City: Boston
State: MA
Zip: 02116
Email rebholz.jessica@gmail.com
Phone: 2035361833

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

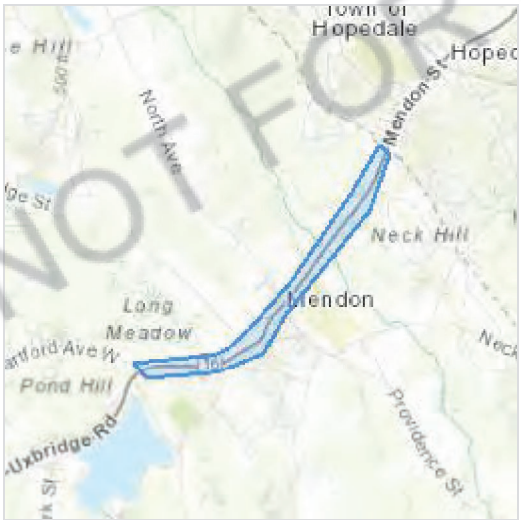
This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Worcester County, Massachusetts



Local office

New England Ecological Services Field Office

(603) 223-2541
(603) 223-0104

70 Commercial Street, Suite 300
Concord, NH 03301-5094

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can**only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

NOT FOR CONSULTATION

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below.

NOT FOR CONSULTATION

Specifically, please review the"Supplemental Information on Migratory Birds and Eagles"

Additional information can be found using the following links:

- Eagle Managementhttps://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are likely bald eagles present in your project area. For additional information on bald eagles, refer toBald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Oct 15 to Aug 31
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere

NOT FOR CONSULTATION

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read

"Supplemental Information on Migratory Birds and Eagles"specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence(■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort(|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

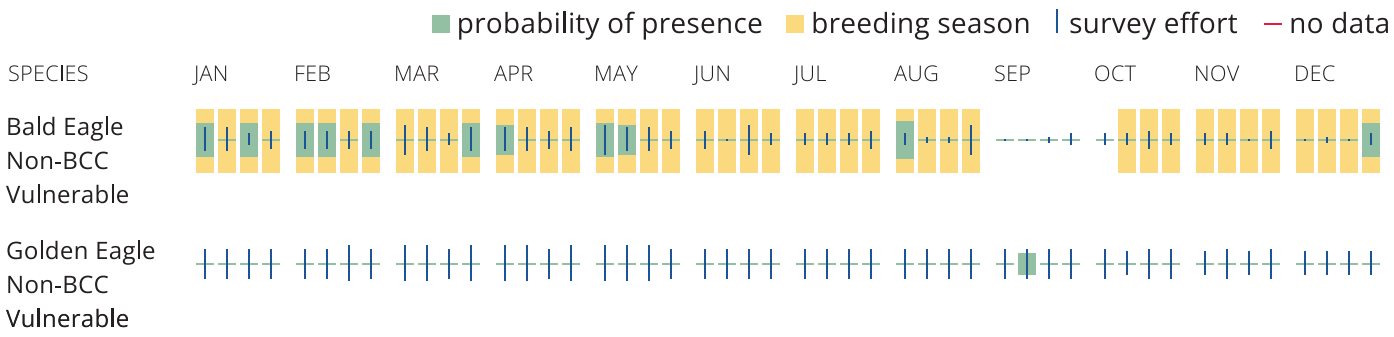
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

NOT FOR CONSULTATION

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

NOT FOR CONSULTATION

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles"

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON

NOT FOR CONSULTATION

Bald Eagle Haliaeetus leucocephalus — Breeds Oct 15 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Black-billed Cuckoo Coccyzus erythropthalmus — Breeds May 15 to Oct 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9399

Blue-winged Warbler Vermivora cyanoptera — Breeds May 1 to Jun 30
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Bobolink Dolichonyx oryzivorus — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Canada Warbler Cardellina canadensis — Breeds May 20 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Chimney Swift Chaetura pelagica — Breeds Mar 15 to Aug 25
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Golden Eagle Aquila chrysaetos — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Kentucky Warbler Geothlypis formosa — Breeds Apr 20 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

NOT FOR CONSULTATION

Pectoral Sandpiper Calidris melanotos This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Prairie Warbler Setophaga discolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Scarlet Tanager Piranga olivacea This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 10 to Aug 10
Semipalmated Sandpiper Calidris pusilla This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

NOT FOR CONSULTATION

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles"specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence(■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

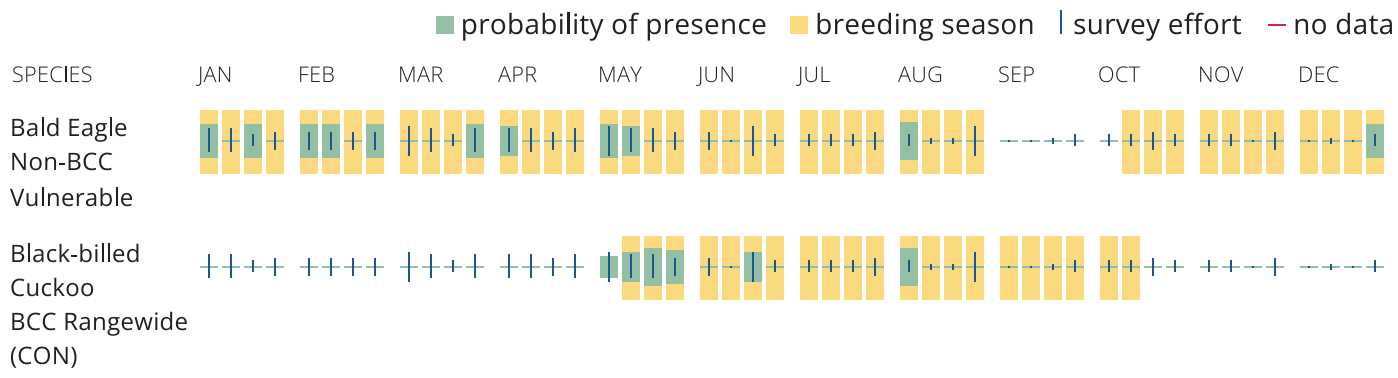
Breeding Season ( )
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

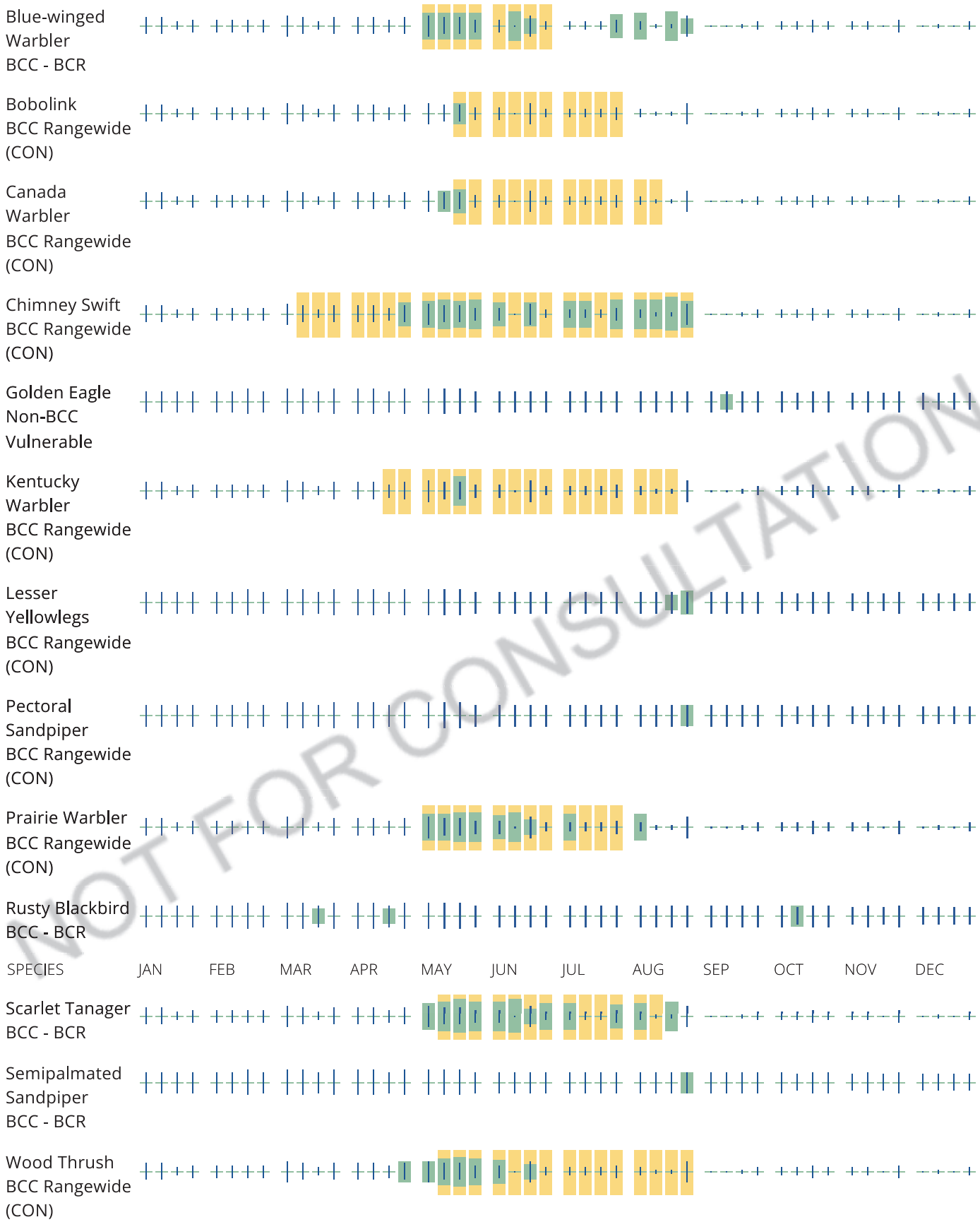
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



NOT FOR CONSULTATION



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Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);

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2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1C
- PEM1E

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1/4E
- PFO1E
- PSS1E

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RIVERINE

R4SBC

R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Appendix F – Section 106 Consultation

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

MassDOT
Massachusetts Department of Transportation
Highway Division

December 10, 2024

RECEIVED
DEC 10 2024
MASS. HIST. COMM

Ms. Brona Simon, Executive Director
Massachusetts Historical Commission
State Historic Preservation Officer
220 Morrissey Boulevard
Boston, MA 02125

RE: Mendon, Route 16 Resurfacing and Related Work (608491)
Section 106 Review - No Adverse Effect
Section 4(f) Evaluation – Fee Takings and Permanent Easements – *de minimis*
Section 4(f) Evaluation – Temporary Occupancies – No 4(f) Use

Dear Ms. Simon:

The Massachusetts Department of Transportation (MassDOT) is proposing to expend federal funds to resurface and construct related work along Route 16 in Mendon. The project corridor will extend for 1.9 miles from Taft Avenue northerly to the Hopedale Town Line. Route 16 is known locally by three different names along the project corridor: Uxbridge Road from Taft Avenue north to Millville Road, Hastings Street from Milleville Road north to North Ave./Main St., and Milford Street from North Ave./Main St. north to the Hopedale Town Line. Route 16 is a state highway owned and maintained by MassDOT.

Route 16 extends through the Mendon Center Historic District, which is listed in the National Register of Historic Places. The historic district includes the entire length of Hastings Street and a 0.6-mile segment of Milford Street. Main Street and Maple Street, which intersect with Route 16, also are within the historic district. The historic district is primarily residential along the project corridor with dates of construction extending from the 1830s into the early 20th century. Founders Park, a 0.75-acre pocket park established by the Town in 1906 on a former residential parcel, is located along Hastings Street at the southwesterly corner of Main Street. Hastings Street between Emerson Street and Main Street is also within the Mendon Center Local Historic District.

MassDOT has reviewed the project under the Massachusetts Statewide Programmatic Agreement for Section 106 of the National Historic Preservation Act of 1966, as amended [36 CFR 800], and has determined that the proposed work will have **No Adverse Effect** on any properties that are listed or eligible for listing in the National Register of Historic Places.

MassDOT's design consultant, HNTB, made a virtual presentation to members of both the Mendon Historical Commission and the Mendon Historic District Commission on June 28, 2020. None of the commission members in attendance expressed objections or substantial concerns about the proposed project. MassDOT is forwarding copies of this No Adverse Effect finding to both commissions to update them on the project design.

Proposed Work along the Project Corridor

- Route 16 will be milled and resurfaced for the entire length of the project corridor. The roadway will be widened along the southbound travel lane primarily within the existing State Highway Layout (SHLO) to provide additional cross section to accommodate turn lanes and a continuous 5'-wide shoulder for a southbound bicycle lane. A 5.5'-wide continuous asphalt sidewalk will be constructed within the SHLO along the southbound travel lane for the entire length of the project corridor. The sidewalk will include granite curbs and ADA compliant ramps.
- The curbline along the northbound travel lane will be extended into the existing roadway to allow for the construction of an 8'-wide asphalt shared use path along the roadway within the existing SHLO.
- Two stormwater management areas will be constructed within the project corridor. Both will consist of grassed channels with sediment forebays and stone checkdams for collection and treatment of stormwater runoff. One of the stormwater management areas is located along southbound Route 16 (Uxbridge Road) south of the Hartford Avenue intersection near the southerly limit of the project corridor. The other is located along northbound Route 16 (Milford Street) at Muddy Brook near the northerly limit of the project corridor. These stormwater management areas are discussed further in the archaeological section below.
- An existing reinforced concrete culvert that conveys Muddy Brook under Route 16 will be retained in place but will be extended under the new shared use path along the northbound side of the roadway. A new concrete headwall will be constructed at the culvert extension and riprap will be installed along the slope.

Mendon Center Historic District

Vibration Monitoring. Seismographs will be placed in five dwellings along northbound Hastings Street within the Mendon Center Historic District to monitor construction vibrations during pavement milling, resurfacing, and shared use path construction along. The seismographs will be placed only with the permission of the respective property owners. Pre-construction photos of the interiors of those dwellings also will be taken to provide a baseline to determine if any vibration impacts might be the result of construction activities. These dwellings include #4 Hastings Street, #6 Hastings Street, #8 Hastings Street, and #10 Hastings Street, which front onto Hastings Street and are very close to the current edge of pavement. The fifth dwelling is #23 Maple Street, the rear elevation of which is also very close to the edge of pavement along Hastings Street. The seismographs will be monitored during construction by a professional engineer certified in such work. A special provision (attached) will be included in the construction contract regarding vibration monitoring.

Maple Street. (Sheets 38, 133, and 154 of the Construction Plans) The Y-intersection of Maple Street at Hastings Street will be reconfigured to create a more perpendicular Maple Street approach at the intersection. Maple Street is currently under STOP sign control at the intersection while traffic on Hastings Street is free-flowing. A slip lane along northbound Hastings Street allows traffic to veer onto Maple Street at high speeds. The Y-intersection is adjacent to the **Woods Civil War Memorial (MEN.901)** on a narrow gore parcel on the north

side of the intersection. The memorial is partially within the SHLO. A paved cut-through lane behind the Civil War Memorial currently provides a perpendicular approach (without STOP sign control) for traffic on Maple Street to turn right onto northbound Hastings Street.

The Maple Street approach at the intersection will be shifted north through the gore parcel to create a more perpendicular alignment at Hastings Street. The Civil War Memorial, including the granite border around the memorial, will be moved about 10' to the north on the same parcel but outside of the SHLO. The existing cut-through lane behind the memorial will be resurfaced as a parking area off Maple Street but access onto Hastings Street will be eliminated. A sidewalk will be constructed along Maple Street at the intersection adjacent to the memorial. The intersection will be signalized, and new mast arm traffic signals will be installed. The new mast arm signal poles will be powder coated black to make them less conspicuous in the historic district. Left turns from southbound Hastings Street onto Maple Street will be prohibited. A special provision for Monument Removed and Reset #2 (Item 714.02, enclosed) will be included in the construction contract.

A new mid-block pedestrian crosswalk will be created across Hastings Street approximately 540' north of the Maple Street intersection. Rectangular rapid flashing beacons will be installed at either end of the new crosswalk to provide additional safety for pedestrians. The poles that support the RRFBs will be powder coated black to make them less conspicuous in the historic district. Please see Sheet 134 of the construction plans.

Main Street/North Street. (Sheets 40, 135, and 154) The approaches at the four-legged signalized intersection of Main Street, North Street, Hastings Street (Route 16), and Milford Street (Route 16) will be widened to provide dedicated turn lanes, a continuous dedicated bicycle lane along southbound Route 16, a dedicated bicycle lane along westbound Main Street, and a dedicated bicycle lane along eastbound North Street.

The existing outmoded vertical signal poles will be replaced at the intersection with new mast arm signal poles, which will be powder coated black to make them less conspicuous in the historic district.

The existing stone balance walls along southbound Milford Street will be removed and reset behind the new edge of pavement to provide the necessary additional cross section at the Milford Street approach to the intersection. Any stone balance walls along Milford Street that will not be affected by the roadway widening will be retained in place. The new alignments for the reset stone balance walls are highlighted in yellow on the construction plans. A special provision for Historic Stone Balance Walls Removed and Reset (Item 691.2, enclosed) will be included in the construction contract.

A stone retaining wall, formerly on the property of the W. H. Comstock House (MEN.54), 1 Hastings Street at North Street, will be removed and reset behind the new sidewalk along southbound Hastings Street and eastbound North Street to provide the necessary additional cross section at those approaches to the intersection. The W. H. Comstock House was demolished by others and the parcel is currently occupied by a modern bank building. The retaining wall, highlighted in yellow on the construction plans, will be reconstructed along Hastings Street and

at the corner of North Street using the existing stones and matching new stones as necessary. The segment of wall along North Street that will not be affected by the intersection reconfiguration will be retained in place. A special provision for Historic Stone Masonry Walls Removed and Reset (Item 691.01, enclosed) will be included in the construction contract. Please see Sheets 40, 136, 154, and 200-202 of the construction plans.

All stone wall reconstruction will be designed and supervised by a professional stone mason.

A triangular traffic island at the Main Street approach to the intersection will be removed to provide the necessary additional cross section at the Main Street approach to the intersection. A cast iron directional sign will be removed from the traffic island and reset at the reconfigured corner of Main Street and Milford Street.

No roadway widening is proposed along northbound Hastings Street or westbound Main Street adjacent to Founders Park. The existing granite Milestone 37, dated 1785, on Hastings Street along the former Middle Post Road adjacent to Founders Park will remain in place behind the proposed new shared use path (SUP) and will be protected with temporary chain link fencing during construction. Milestone 37 is within the existing SHLO. An adjacent granite post, which appears to be a property line marker, also will be retained and will be protected behind the temporary fencing during construction. The SUP will be constructed with a 2'-wide buffer separating it from the milestone, which is considered adequate width to protect the milestone from snowplow strikes. The current plans enclosed with this submittal indicate that Milestone 37 will be removed and reset but those plans will be revised to indicate that the milestone will be retained in place and protected. MassDOT has prepared an Inventory Form C for Milestone 37, which is eclosed with this submittal.

Other Stonework. (Sheet 38) A pair of parallel stone masonry walls along a walkway in front of the c. 1908 Craftsman style dwelling at **#21 Hastings Street (MEN.63)** are partially within the existing SHLO. The two walls will be dissembled by a professional stone mason and reset on either side of the reconstructed walkway behind the proposed new sidewalk along southbound Hastings Street at that location. A special provision for Historic Stone Railing Walls Removed and Reset (Item 691.01, enclosed) will be included in the construction contract.

A set of three granite steps in front of the **South Parish Unitarian Church Parsonage (MEN.62)**, 17 Hastings Street, also will be removed and reset behind the proposed new sidewalk along southbound Hastings Street at that location. The granite steps are partially within the SHLO. A special provision for Granite Steps Removed and Relaid (Item 706.4, enclosed) will be included in the construction contract.

Archaeological Assessment

A review of the MHC's archaeological maps in MACRIS revealed four recorded pre-contact sites in the vicinity of the project area.

- Site 19-WR-107 is an unnamed site recorded 0.25-miles southwesterly of the Uxbridge Rd. / Taft Ave. intersection.

- Site 19-WR-673 (Nextel Tower Site) is an isolated flake scatter identified in 2000 as part of a cell tower survey. This site is recorded approximately 0.15-miles southwesterly of the Uxbridge Rd. / Taft Ave. intersection. No diagnostic artifacts were recovered, and the site was determined to be not significant.
- Site 19-WR-1130 (321w-3 Site) is an isolated flake scatter identified in 2017 as part of a National Grid feeder pole location survey. The site is recorded approximately 0.25-miles northwesterly of the Uxbridge Rd. / Hartford Ave. intersection.
- Site 19-WR-798 (Upton State Forest Site) is a find spot identified in advance of gas line surveys conducted 1989 and 1991. The site is recorded near Dudley Road approximately 0.25-miles northerly of the current project area.

An additional archaeological survey was conducted in 1987 immediately west of the current project area in advance of Hartford Avenue reconstruction work. The survey identified four historic sites and no pre-contact sites. The historic sites are recorded in the Town of Uxbridge well outside of the current project's APE.

Although undisturbed areas near Nipmuc Pond and Muddy Brook may be sensitive for archaeological resources, it is the opinion of the MassDOT Archaeologist, Jameson Harwood, that the Uxbridge Rd (Route 16) project's direct APE has low sensitivity for significant archaeological resources based on the results of previous archaeological surveys, the impacts of previous roadway, trolley line, sidewalk, utility, and drainage construction, roadside development, and unfavorable conditions (wetland / slope). The project work will be confined to disturbed / unfavorable areas within and immediately adjacent to the existing state highway layout.

Infiltration Basin at Uxbridge Rd / Hartford Ave Intersection (Station 205 to Station 210 LT on Sheets 31-32, 102-103, and 188 of the enclosed Construction Plans)

Drainage work between Station 205+00 LT and Station 210+00 LT will consist of the construction of an infiltration basin along the north side of Uxbridge Road and drainage ditch to the adjacent wetlands. A review of historic maps and aerials indicates this location has been modified throughout the early 20th century. A review of the 1908 USGS map shows a short section of rail line near the western end of the project area that curves from Nipmuc Pond northeasterly to Uxbridge Road. The Town of Mendon's Open Space and Recreation Plan notes that the Milford and Uxbridge Trolley Line opened on December 20, 1901 to provide public access to a park at Nipmuc Pond. This section of rail line does not appear on 1919 USGS map.

The 1938 historic aerial and the 1944 USGS map shows the new alignment of Route 16/Uxbridge Road to the east of the Uxbridge Road / Hartford Avenue "T" intersection. This "T" intersection was bypassed and the former Uxbridge Road approach to Hartford Avenue was removed as it does not appear on the 1953 USGS map.

The 2013 Streetview image shows an overgrown paved driveway at the proposed location of the infiltration basin. The 1967 and 1971 aerials show cleared areas and a section of driveway/roadway along the north side of Uxbridge Road at this location. A further review of aerials indicates the cleared areas and roadway have become overgrown with vegetation throughout the late 20th and early 21st century.

Infiltration Basin (Station 268 RT to Station 270+50 RT on Sheets 42-43, 113-114, and 189 of the Construction Plans)

The proposed infiltration basin to be constructed along the south side of the roadway at 21 Milford St. (Route 16) between Station 268 RT to Sta 270 + 50 RT will upgrade an existing drainage swale.

Infiltration Basin (Station 274+50 RT)

The proposed drainage work near Station 274+50 will upgrade existing culverts and drainage structures near Muddy Brook. The infiltration basin will be along the toe of the roadway slope.

Section 4(f) Evaluation – Fee Takings and Permanent Easements – *de minimis* impact

This project requires minor fee takings and permanent easements on parcels occupied by properties that contribute to the National Register-listed **Mendon Center Historic District.** Any fee takings or easements that result in the permanent incorporation of land from a public or private historic site into a transportation facility is regarded as a transportation use and must be evaluated and approved under Section 4(f) of the National Transportation Act of 1966, as amended [23 CFR Part 774].

Fee takings are highlighted in blue on the enclosed ROW plans. The following fee takings are required along the southbound side of Hastings Street to create a consistent cross section of sidewalk construction.

- **Cook-Darling House (MEN.68),** 33 Hastings Street, Parcel 2-17 (62 sf).
- **G. A. Staples House (MEN.67),** 31 Hastings Street, Parcel 2-18 (4 sf).
- **Cook-Adams House (MEN.64),** 23 Hastings Street, Parcel 2-6 (46 sf).
- **Ebenezer Haywood-Davenport House (MEN.58),** 7 Hastings Street, Parcel 2-15 (1 sf).
- **Dr. John G. Metcalf House (MEN.55),** 3 Hastings Street, Parcel 2-5 (339 sf).

A fee taking also is required for traffic signal installation on the southbound side of Hastings Street across from the Maple Street intersection.

- **House at 21 Hastings Street (MEN.63),** Parcel 2-13 (20 sf).

Permanent utility easements (PUEs), highlighted in pink on the ROW plans, are required on parcels occupied by contributing properties within the National Register-listed Mendon Center Historic District. The PUEs are required for realignment of overhead utility wires or installation of utility poles with guy wires.

- **Cook-Darling House (MEN.68),** 33 Hastings Street, Parcel 2-PUE-2 (600 sf).
- **G. A. Staples House (MEN.67),** 31 Hastings Street, Parcel 2-PUE-3 (733 sf).
- **Cook-Adams House (MEN.64),** 23 Hastings Street, Parcel 2-PUE-24 (92 sf).
- **House at 21 Hastings Street (MEN.36),** Parcels 2-PUE-7 (28 sf) and 2-PUE-39 (70 sf).
- **Seth Hastings House (MEN.60),** 10 Hastings Street, Parcel 2-PUE-12 (968 sf).
- **Holland-Albee Bakery Worker House (MEN.59),** 8 Hastings St., Parcel 2-PUE-56 (38 sf).
- **Town of Mendon, Woods Civil War Memorial (MEN. 901),** Hastings Street at Maple Street, Parcel 2-PUE-5 (467 sf).\
- **Hayward-Taft House (MEN.106),** 38 Maple Street, Parcels 2-PUE-6 (592 sf) and 2-PUE-53 (40 sf).
- **D. Eames-Wallahan House (MEN.100),** 23 Maple Street, Parcel 2-PUE-34 (273 sf).
- **B. Anthony-Inman House (MEN.98),** 17 Maple Street, Parcel 2-PUE-10 (137 sf).
- **House at 34 Maple Street (MEN.105),** Parcel 2-PUE-38-T (48 sf).
- **House at 11 Milford Street (MEN.234),** Parcel 2-PUE-42 (67 sf).

Permanent drainage easements, highlighted in pink on the ROW plans, are required on parcels occupied by contributing properties within the National Register-listed Mendon Center Historic District. The drainage easements are required for construction of linear roadside drainage ditches.

- **Cook-Adams House (MEN.64),** 23 Hastings Street, Parcels 2-D-8 (660 sf) and 2-D-9 (213 sf).
- **House at 21 Hastings Street (MEN.36),** Parcels 2-D-10 (174 sf), 2-D-11 (368 sf), and 2-D-12 (131 sf).
- **South Parish Unitarian Church Parsonage (MEN.62),** 17 Hastings Street, Parcel 2-D-13 (506 sf).
- **Walter T. Metcalf House (MEN.61),** 15 Hastings Street, Parcel 2-D-14 (277 sf).
- **Ebenezer Haywood-Davenport House (MEN.58),** 7 Hastings St., Parcel 2-D-15 (249 sf).
- **Dr. John G. Metcalf House (MEN.55),** 3 Hastings Street, Parcel 2-D-17 (665 sf).

Permanent highway sign easements, highlighted in pink on the ROW plans, are required on parcels occupied by contributing properties within the National Register-listed Mendon Center Historic District. These easements are required for the installation of roadside highway signs.

- **B. Anthony-Inman House (MEN.98),** 17 Maple Street, Parcel 2-HS-2-T (8 sf).
- **Dr. John G. Metcalf House (MEN.55),** 3 Hastings Street, Parcel 2-HS-6 (6 sf).

It is MassDOT's expectation that the Federal Highway Administration (FHWA) will determine that the proposed permanent easements meet the criteria for a Section 4(f) *de minimis* finding, pursuant to 23 CFR 774.3(b). This project, therefore, does not require an individual Section 4(f) evaluation. This letter is intended to inform the State Historic Preservation Officer (SHPO) that this project is expected to qualify for a *de minimis* finding under Section 4(f) based on the concurrence of your office with this Section 106 finding of No Adverse Effect, pursuant to 23 CFR 774.5(b)(1)(ii).

Section 106 Effect Finding

It is MassDOT's opinion that the proposed resurfacing and widening of Route 16 in Mendon will have **No Adverse Effect** on the National Register-listed Mendon Center Historic District. MassDOT has designed the project to remain within the existing State Highway Layout to the greatest extent feasible, with minimal fee takings from parcels occupied by properties that contribute to the historic district. The existing paved roadway will be narrowed along Hastings Street to provide the necessary cross section to construct an 8'-wide shared use path along the northbound side of Route 16 without requiring any additional right of way in the historic district. All new traffic signal poles within the historic district will be powder coated black to make them less conspicuous. Seismographs will be installed in five dwellings along northbound Hastings Street within the historic district to monitor vibrations during construction that could be potentially harmful to the historic properties.

MassDOT will carefully remove the Woods Civil War Memorial from within the SHLO at the intersection of Hastings Street and Maple Street and relocate the memorial to an appropriate nearby location on the same parcel but entirely outside of the SHLO. Other stone features along Route 16 within the historic district, such as balance walls, retaining walls, railing walls, and stone slab steps, also will be carefully removed and reset outside of the SHLO or beyond the edge of pavement under the supervision of a professional stone mason. The 1785 Milestone 37 will remain in its current location within the SHLO adjacent to Founders Park and will be protected during construction. MassDOT has prepared an inventory form for Milestone 37, which is enclosed with this submittal.

MassDOT solicits your concurrence with this No Adverse Effect finding in accordance with Stipulation V.C.1 of the amended Section 106 Programmatic Agreement. A copy of this letter will be forwarded to the Federal Highway Administration as specified under the terms of the Programmatic Agreement. If you should have any questions, please feel free to contact me at 978-325-2094.

Sincerely,

Jeffrey Shrimpton

Jeffrey Shrimpton
Program Engineer for Design
Environmental Services

c.c.: Mendon Historical Commission
Mendon Historic District Commission
Kenneth S. Miller, FHWA

encs: Locus Map
Construction & Right of Way Plans
Special provisions
Milestone 37 inventory form

FOR FHWA USE

MassDOT Request for Federal Highway Administration (FHWA) Approval

MassDOT Highway Division requests final approval from FHWA that the proposed "use" of the above-described Section 4(f) resources meets the criteria of a *de minimis* impact, as specified under 23 CFR 774.17.

_____ _____

Joi Singh, Division Administrator (or designee) Date
Federal Highway Administration
Massachusetts Division

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NEW ENGLAND DISTRICT
REGULATORY DIVISION
696 VIRGINIA ROAD
CONCORD MA 01742

December 23, 2024

Regulatory Division
Transportation & Utility Section

Erica Larner
MassDOT – Highway Division
10 Park Plaza
Boston, Massachusetts 02116
Via Email: erica.n.larner@dot.ma.us

Dear Ms. Larner:

This letter is in response to the application you submitted to the U.S. Army Corps of Engineers, New England District Regulatory Division on December 19, 2024 for a Department of the Army permit verification. This project has been assigned the file number NAE-2024-03024. This file number should be referenced in all correspondence with this office.

The proposed work includes the reconstruction and resurfacing of 1.9 miles of Route 16 (Uxbridge Road), including extending a culvert conveying an unnamed intermittent stream and repairing headwalls associated with a culvert conveying Muddy Brook in Mendon, Worcester County, Massachusetts.

We have completed our initial review of the application and determined that it is incomplete. The following information listed in the enclosed checklist is necessary to have a complete application. Please provide this information in one consolidated response within 30 days (January 22, 2025) of the date of this correspondence. We will administratively withdraw your application if you do not respond within the 30-day timeframe. However, we will reopen your file upon our receipt of the requested information.

1. Please provide documentation (delivery receipts) that you provided the required notification to the Board of Underwater Archaeological Resources (BUAR) and the Tribal Historic Preservation Officers (THPOs) of the Wampanoag (Aquinnah), Mashpee Wampanoag, and Narragansett Tribes.

2. Please provide SHPO's response to the request for concurrence of No Adverse Effect, once available.

3. The submitted plan set is too large, both in terms of total number of sheets and file size. Ideally, plan sets should be 10 MB or less. Please try to reduce the file size and total number of sheets. For example, construction plans and cross sections without jurisdictional impacts should be removed from the file.

4. Please renumber the plan set to form a sequential set after reducing the plan set. Please revise the key sheet after sheets have been reduced to reflect the updated plan set.

5. Please provide representative photos of the culverts and headwalls proposed to be altered.

6. Please revise plans to show Corps jurisdictional terminology. The Corps jurisdictional limit in non-tidal water is the Ordinary High Water Mark (OHWM).

7. Please depict the OHWM of the streams flowing through culverts in the plan set. Any impacts below the OHW of the intermittent stream or Muddy Brook resulting from dewatering, including through culverts, would need to be calculated and called out on the plans. Dewatering is typically considered a temporary discharge of fill.

8. Please clarify the flow path of the unnamed intermittent stream near ST 224. Does the stream inlet on the other side of Route 16?

9. The proposed impacts near ST 275 depicts a total of 96 SF of temporary impacts but appears to only include the area within the proposed diversion pipe and the cofferdam itself. Please revise the plans and impact summary to include the total SF of WOTUS dewatered below the OHW, including through the culvert.

10. Will the proposed retaining walls replacing the headwalls of the culvert conveying Muddy Brook be installed below OHW? If so, they should be included as permanent discharge of fill.

11. The narrative calls for a temporary concrete scour pad associated with the dewatering of Muddy Brook. Please add the proposed scour pad to the plan and calculate the total SF of impacts below OHW, if applicable.

12. The narrative notes that IPaC lists the tricolored bat (proposed endangered) as potentially present at the site. Please state the lead federal agency's (FHWA or MassDOT on behalf of FHWA) effect determination for this species and provide documentation of any coordination that was coordinated with USFWS. The narrative notes that MassDOT will employ several avoidance and minimization measures in compliance with the ESA, but I could not locate these measures.

13. The narrative states the project will not result in any permanent impacts to the FEMA Regulatory Floodway associated with Muddy Brook. To assist with our required FEMA coordination, please provide a statement explicit to whether the project will result in any increase in the base flood elevation (BFE) or alter the existing floodway delineation. If a Hydraulic Study Report/No-Rise Analysis was produced, please provide a copy.

Please note, we cannot process your application further until the additional information requested is received. You are cautioned that commencement of the proposed work in waters of the United States subject to U.S. Army Corps of Engineers jurisdiction prior to DA authorization would constitute a violation of federal laws and subject you to possible enforcement action.

Please contact Kevin Newton at (978)-318-8044, or by email at kevin.m.newton@usace.army.mil if you have any questions concerning this correspondence.

Sincerely,

Kevin Newton
Project Manager / Biologist

Enclosures

cc:
Kevin Thompson, MassDOT (via kevin.s.thompson@dot.state.ma.us)
Marissa Seifert, HNTB Corporation (via mseifert@htnb.com)
Heidi Davis, MassDEP (via heidi.davis@mass.gov)Tyler Lewis, MassDEP (via tyler.lewis@mass.gov)
Ryan Hale, MassDEP (via ryan.hale@mass.gov)

HNTB Corporation
The HNTB Companies
Engineers Architects Planners

31 St. James Avenue, Suite 300
Boston, MA 02116

Telephone (617) 542-6900
Facsimile (617) 428-6905
www.hntb.com

March 4, 2025

Kevin Newton, Project Manager/Biologist
U.S. Army Corps of Engineers, Regulatory Division
696 Virginia Road
Concord, MA 01742

Re: File Number: NAE-2024-03024
Request for Additional Information
Resurfacing and Related Work on Route 16
Mendon, Massachusetts

Dear Mr. Newton,

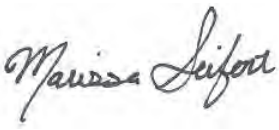
The New England District of the U.S. Army Corps of Engineers (USACE), Regulatory Division completed its technical review of the above-referenced permit application and has provided comments and/or requests for additional information. Responses to the USACE's comments and/or requests are provided in the table below.

Item No.	USACE Comment/Request for Additional Information	Consultant Response
1.	Please provide documentation (delivery receipts) that you provided the required notification to the Board of Underwater Archaeological Resources (BUAR) and the Tribal Historic Preservation Officers (THPOs) of the Wampanoag (Aquinnah), Mashpee Wampanoag, and Narragansett Tribes.	A copy of the requested delivery receipts for the required notification to the Board of Underwater Archaeological Resources (BUAR) and the Tribal Historic Preservation Officers (THPOs) of the Wampanoag (Aquinnah), Mashpee Wampanoag, and Narragansett Tribes has been included with this submission as Attachment A.
2.	Please provide SHPO's response to the request for concurrence of No Adverse Effect, once available.	A copy of the requested response from the State Historic Preservation Office (SHPO) to the request for concurrent of No Adverse Effect has been included with this submission as Attachment B.
3.	The submitted plan set is too large, both in terms of total number of sheets and file size. Ideally, plan sets should be 10 MB or less. Please try to reduce the file size and total number of sheets. For example, construction plans and cross sections without jurisdictional impacts should be removed from the file.	The plan set has been reduced to less than 10 MB. The updated plan set has been included with this submission as Attachment C.
4.	Please renumber the plan set to form a sequential set after reducing the plan set. Please revise the key sheet after sheets have been reduced to reflect the updated plan set.	The plan set has been renumbered as requested to form a sequential set, with the key sheet revised to reflect the updated plan set. The updated plan set has been included in the submission as Attachment C.

5.	Please provide representative photos of the culverts and headwalls proposed to be altered.	A representative photo log of sites with proposed culvert and headwall alterations has been included in the submission as Attachment D.
6.	Please revise plans to show Corps jurisdictional terminology. The Corps jurisdictional limit in non-tidal water is the Ordinary High-Water Mark (OHWM).	The plan set has been revised to show the Corps jurisdictional terminology. The updated plan set has been included in the submission as Attachment C.
7.	Please depict the OHWM of the streams flowing through culverts in the plan set. Any impacts below the OHW of the intermittent stream or Muddy Brook resulting from dewatering, including through culverts, would need to be calculated and called out on the plans. Dewatering is typically considered a temporary discharge of fill.	The Ordinary High-Water Mark (OHWM) of streams flowing through culverts in the plan set, as well as impacts below the OHW resulting from dewatering have been calculated. The updated plan set has been included in the submission as Attachment C.
8.	Please clarify the flow path of the unnamed intermittent stream near ST 224. Does the stream inlet on the other side of Route 16?	The unnamed intermittent stream near STA 224 appears to be tied to the existing drainage system and may inlet beyond the parking lot on the south side of Route 16 near the vicinity of Veteran's Park. The stream outlets through the existing culvert under Route 16 and then outlets into the delineated wetland HNTB-G.
9.	The proposed impacts near ST 275 depicts a total of 96 SF of temporary impacts but appears to only include the area within the proposed diversion pipe and the cofferdam itself. Please revise the plans and impact summary to include the total SF of WOTUS dewatered below the OHW, including through the culvert.	The plans and impact summary have been updated to include the total square feet (SF) of WOTUS dewatered below the OHW, including through the culvert. These are included as Attachment C (updated project plans) and Attachment E (updated narrative).
10.	Will the proposed retaining walls replacing the headwalls of the culvert conveying Muddy Brook be installed below OHW? If so, they should be included as permanent discharge of fill.	The proposed retaining walls that will replace the headwalls of the culvert conveying Muddy Brook will be installed above the OHW, as demonstrated in the plans, included as Attachment C.
11.	The narrative calls for a temporary concrete scour pad associated with the dewatering of Muddy Brook. Please add the proposed scour pad to the plan and calculate the total SF of impacts below OHW, if applicable.	The project design will no longer include temporary scour pad associated with the dewatering of Muddy Brook, and therefore this has not been included on the plans or in the impact summary.
12.	The narrative notes that IPaC lists the tricolored bat (proposed endangered) as potentially present at the site. Please state the lead federal agency's (FHWA or MassDOT on behalf of FHWA) effect determination for this species and provide documentation of any coordination that was coordinated with USFWS. The narrative notes that MassDOT will employ several avoidance and minimization measures in compliance with the ESA, but I could not locate these measures.	FHWA correspondence, included in Attachment F, states that "For projects that have previously undergone consultation with the USFWS on effects to the Indiana bat or the NLEB, all consultations remain valid and in effect". Given this, the NLAA received in 2022 and "No effect" received in 2023 may serve as our consultation with the FWS under the ESA, included in Attachment F. Avoidance and minimization measures have been included within the updated project narrative, included as Attachment E.

13.	The narrative states the project will not result in any permanent impacts to the FEMA Regulatory Floodway associated with Muddy Brook. To assist with our required FEMA coordination, please provide a statement explicit to whether the project will result in any increase in the base flood elevation (BFE) or alter the existing floodway delineation. If a Hydraulic Study Report/No-Rise Analysis was produced, please provide a copy.	A copy of the requested "Muddy Brook Culvert - Hydraulic Analysis" Report is included with this submission as Attachment G. This Report states that "the scope of the culvert work on the project has shifted to be culvert repair only…to avoid impacts to a federal floodway". The culvert limits, location, size and inverts will be maintained, and the only work proposed will be what is necessary to perform the required repairs and maintain a compliant design for the new roadway over the top of the culvert. Further, the report states that no modifications are proposed to the hydraulic openings of the culverts on either side and no length will be added.

Regards,



Marissa Seifert, PWS
Section Manager - Wetlands

cc: Erica Larner, MassDOT
Kevin Thompson, MassDOT
James Barnack, HNTB

List of Attachments

- Attachment A – Copy of Required Notification to the Board of Underwater Archaeological Resources (BUAR) and the Tribal Historic Preservation Officers (THPOs) of the Wampanoag (Aquinnah), Mashpee Wampanoag, and Narragansett Tribes
- Attachment B – Copy of SHPO's Response to the Request for Concurrence of No Adverse Effect
- Attachment C – Revised Permit Plans
- Attachment D – Representative Photo Log of Proposed Culvert and Headwall Alterations
- Attachment E – Revised Project Narrative
- Attachment F – USFWS Correspondence
- Attachment G – Muddy Brook Culvert - Hydraulic Analysis Report

Attachment A

Copy of Required notification to the Board of Underwater Archaeological Resources (BUAR) and the Tribal Historic Preservation Officers (THPOs) of the Wampanoag (Aquinnah), Mashpee Wampanoag, and Narragansett Tribes

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Bettina Washington
Sent: Tuesday, November 26, 2024 1:38 PM
Subject: Relayed: MassDOT 608491: Mendon, Rt 16 (Project Notification)

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

Bettina Washington (thpo@wampanoagtribe-nsn.gov)

Subject: MassDOT 608491: Mendon, Rt 16 (Project Notification)

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Tuesday, November 26, 2024 1:38 PM
To: Bettina Washington
Subject: MassDOT 608491: Mendon, Rt 16 (Project Notification)
Attachments: Mendon, Rt 16 PNF (608491).pdf; Mendon, Rt 16 Construction plans (608491).pdf

Ms. Washington,

MassDOT is submitting information for the above-referenced project to the THPO to meet the Section 106 consultation requirements of FHWA (lead federal agency) and US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@dot.state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Robinson, David S (EEA)
Sent: Tuesday, November 26, 2024 1:36 PM
Subject: Delivered: MassDOT 608491: Mendon, Rt 16 (Project Notification)

Your message has been delivered to the following recipients:

Robinson, David S (EEA) (David.S.Robinson@mass.gov)

Subject: MassDOT 608491: Mendon, Rt 16 (Project Notification)

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Tuesday, November 26, 2024 1:36 PM
To: Robinson, David S (EEA)
Subject: MassDOT 608491: Mendon, Rt 16 (Project Notification)
Attachments: Mendon, Rt 16 PNF (608491).pdf; Mendon, Rt 16 Construction plans (608491).pdf

Tracking:

Recipient	Delivery
Robinson, David S (EEA)	Delivered: 11/26/2024 1:36 PM

David,

MassDOT is submitting information for the above-referenced project to the BUAR to meet the Section 106 consultation requirements of FHWA (lead federal agency) and US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@dot.state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: David Weeden (David.Weeden@mwtribe-nsn.gov)
Sent: Tuesday, November 26, 2024 1:37 PM
Subject: Relayed: MassDOT 608491: Mendon, Rt 16 (Project Notification)

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

David Weeden (David.Weeden@mwtribe-nsn.gov) (David.Weeden@mwtribe-nsn.gov)

Subject: MassDOT 608491: Mendon, Rt 16 (Project Notification)

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Tuesday, November 26, 2024 1:37 PM
To: David Weeden (David.Weeden@mwtribe-nsn.gov)
Subject: MassDOT 608491: Mendon, Rt 16 (Project Notification)
Attachments: Mendon, Rt 16 PNF (608491).pdf; Mendon, Rt 16 Construction plans (608491).pdf

David,

MassDOT is submitting information for the above-referenced project to the THPO to meet the Section 106 consultation requirements of FHWA (lead federal agency) and US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@dot.state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Tashtesook@aol.com; markandrews0563@outlook.com
Sent: Tuesday, November 26, 2024 1:39 PM
Subject: Relayed: MassDOT 608491: Mendon, Rt 16 (Project Notification)

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

Tashtesook@aol.com (Tashtesook@aol.com)

markandrews0563@outlook.com (markandrews0563@outlook.com)

Subject: MassDOT 608491: Mendon, Rt 16 (Project Notification)

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Tuesday, November 26, 2024 1:38 PM
To: Tashtesook@aol.com
Cc: markandrews0563@outlook.com
Subject: MassDOT 608491: Mendon, Rt 16 (Project Notification)
Attachments: Mendon, Rt 16 PNF (608491).pdf; Mendon, Rt 16 Construction plans (608491).pdf

Mr. Brown,

MassDOT is submitting information for the above-referenced project to the THPO to meet the Section 106 consultation requirements of FHWA (lead federal agency) and US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@dot.state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Attachment B

Copy of SHPO's Response to the Request for Concurrence of No Adverse Effect

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

MassDOT Massachusetts Department of Transportation Highway Division

RC. 69951

CONCURRENCE Brona Simon
1/7/25
BRONA SIMON
STATE HISTORIC
PRESERVATION OFFICER
MASSACHUSETTS
HISTORICAL COMMISSION

RECEIVED
DEC 10 2024
MASS. HIST. COMM

December 10, 2024

Ms. Brona Simon, Executive Director
Massachusetts Historical Commission
State Historic Preservation Officer
220 Morrissey Boulevard
Boston, MA 02125

RE: Mendon, Route 16 Resurfacing and Related Work (608491)
Section 106 Review - No Adverse Effect
Section 4(f) Evaluation – Fee Takings and Permanent Easements – *de minimis*
Section 4(f) Evaluation – Temporary Occupancies – No 4(f) Use

Dear Ms. Simon:

The Massachusetts Department of Transportation (MassDOT) is proposing to expend federal funds to resurface and construct related work along Route 16 in Mendon. The project corridor will extend for 1.9 miles from Taft Avenue northerly to the Hopedale Town Line. Route 16 is known locally by three different names along the project corridor: Uxbridge Road from Taft Avenue north to Millville Road, Hastings Street from Milleville Road north to North Ave./Main St., and Milford Street from North Ave./Main St. north to the Hopedale Town Line. Route 16 is a state highway owned and maintained by MassDOT.

Route 16 extends through the Mendon Center Historic District, which is listed in the National Register of Historic Places. The historic district includes the entire length of Hastings Street and a 0.6-mile segment of Milford Street. Main Street and Maple Street, which intersect with Route 16, also are within the historic district. The historic district is primarily residential along the project corridor with dates of construction extending from the 1830s into the early 20th century. Founders Park, a 0.75-acre pocket park established by the Town in 1906 on a former residential parcel, is located along Hastings Street at the southwesterly corner of Main Street. Hastings Street between Emerson Street and Main Street is also within the Mendon Center Local Historic District.

MassDOT has reviewed the project under the Massachusetts Statewide Programmatic Agreement for Section 106 of the National Historic Preservation Act of 1966, as amended [36 CFR 800], and has determined that the proposed work will have **No Adverse Effect** on any properties that are listed or eligible for listing in the National Register of Historic Places.

MassDOT's design consultant, HNTB, made a virtual presentation to members of both the Mendon Historical Commission and the Mendon Historic District Commission on June 28, 2020. None of the commission members in attendance expressed objections or substantial concerns about the proposed project. MassDOT is forwarding copies of this No Adverse Effect finding to both commissions to update them on the project design.

Proposed Work along the Project Corridor

- Route 16 will be milled and resurfaced for the entire length of the project corridor. The roadway will be widened along the southbound travel lane primarily within the existing State Highway Layout (SHLO) to provide additional cross section to accommodate turn lanes and a continuous 5'-wide shoulder for a southbound bicycle lane. A 5.5'-wide continuous asphalt sidewalk will be constructed within the SHLO along the southbound travel lane for the entire length of the project corridor. The sidewalk will include granite curbs and ADA compliant ramps.
- The curbline along the northbound travel lane will be extended into the existing roadway to allow for the construction of an 8'-wide asphalt shared use path along the roadway within the existing SHLO.
- Two stormwater management areas will be constructed within the project corridor. Both will consist of grassed channels with sediment forebays and stone checkdams for collection and treatment of stormwater runoff. One of the stormwater management areas is located along southbound Route 16 (Uxbridge Road) south of the Hartford Avenue intersection near the southerly limit of the project corridor. The other is located along northbound Route 16 (Milford Street) at Muddy Brook near the northerly limit of the project corridor. These stormwater management areas are discussed further in the archaeological section below.
- An existing reinforced concrete culvert that conveys Muddy Brook under Route 16 will be retained in place but will be extended under the new shared use path along the northbound side of the roadway. A new concrete headwall will be constructed at the culvert extension and riprap will be installed along the slope.

Mendon Center Historic District

Vibration Monitoring. Seismographs will be placed in five dwellings along northbound Hastings Street within the Mendon Center Historic District to monitor construction vibrations during pavement milling, resurfacing, and shared use path construction along. The seismographs will be placed only with the permission of the respective property owners. Pre-construction photos of the interiors of those dwellings also will be taken to provide a baseline to determine if any vibration impacts might be the result of construction activities. These dwellings include #4 Hastings Street, #6 Hastings Street, #8 Hastings Street, and #10 Hastings Street, which front onto Hastings Street and are very close to the current edge of pavement. The fifth dwelling is #23 Maple Street, the rear elevation of which is also very close to the edge of pavement along Hastings Street. The seismographs will be monitored during construction by a professional engineer certified in such work. A special provision (attached) will be included in the construction contract regarding vibration monitoring.

Maple Street. (Sheets 38, 133, and 154 of the Construction Plans) The Y-intersection of Maple Street at Hastings Street will be reconfigured to create a more perpendicular Maple Street approach at the intersection. Maple Street is currently under STOP sign control at the intersection while traffic on Hastings Street is free-flowing. A slip lane along northbound Hastings Street allows traffic to veer onto Maple Street at high speeds. The Y-intersection is adjacent to the **Woods Civil War Memorial (MEN.901)** on a narrow gore parcel on the north

side of the intersection. The memorial is partially within the SHLO. A paved cut-through lane behind the Civil War Memorial currently provides a perpendicular approach (without STOP sign control) for traffic on Maple Street to turn right onto northbound Hastings Street.

The Maple Street approach at the intersection will be shifted north through the gore parcel to create a more perpendicular alignment at Hastings Street. The Civil War Memorial, including the granite border around the memorial, will be moved about 10' to the north on the same parcel but outside of the SHLO. The existing cut-through lane behind the memorial will be resurfaced as a parking area off Maple Street but access onto Hastings Street will be eliminated. A sidewalk will be constructed along Maple Street at the intersection adjacent to the memorial. The intersection will be signalized, and new mast arm traffic signals will be installed. The new mast arm signal poles will be powder coated black to make them less conspicuous in the historic district. Left turns from southbound Hastings Street onto Maple Street will be prohibited. A special provision for Monument Removed and Reset #2 (Item 714.02, enclosed) will be included in the construction contract.

A new mid-block pedestrian crosswalk will be created across Hastings Street approximately 540' north of the Maple Street intersection. Rectangular rapid flashing beacons will be installed at either end of the new crosswalk to provide additional safety for pedestrians. The poles that support the RRFBs will be powder coated black to make them less conspicuous in the historic district. Please see Sheet 134 of the construction plans.

Main Street/North Street. (Sheets 40, 135, and 154) The approaches at the four-legged signalized intersection of Main Street, North Street, Hastings Street (Route 16), and Milford Street (Route 16) will be widened to provide dedicated turn lanes, a continuous dedicated bicycle lane along southbound Route 16, a dedicated bicycle lane along westbound Main Street, and a dedicated bicycle lane along eastbound North Street.

The existing outmoded vertical signal poles will be replaced at the intersection with new mast arm signal poles, which will be powder coated black to make them less conspicuous in the historic district.

The existing stone balance walls along southbound Milford Street will be removed and reset behind the new edge of pavement to provide the necessary additional cross section at the Milford Street approach to the intersection. Any stone balance walls along Milford Street that will not be affected by the roadway widening will be retained in place. The new alignments for the reset stone balance walls are highlighted in yellow on the construction plans. A special provision for Historic Stone Balance Walls Removed and Reset (Item 691.2, enclosed) will be included in the construction contract.

A stone retaining wall, formerly on the property of the W. H. Comstock House (MEN.54), 1 Hastings Street at North Street, will be removed and reset behind the new sidewalk along southbound Hastings Street and eastbound North Street to provide the necessary additional cross section at those approaches to the intersection. The W. H. Comstock House was demolished by others and the parcel is currently occupied by a modern bank building. The retaining wall, highlighted in yellow on the construction plans, will be reconstructed along Hastings Street and

at the corner of North Street using the existing stones and matching new stones as necessary. The segment of wall along North Street that will not be affected by the intersection reconfiguration will be retained in place. A special provision for Historic Stone Masonry Walls Removed and Reset (Item 691.01, enclosed) will be included in the construction contract. Please see Sheets 40, 136, 154, and 200-202 of the construction plans.

All stone wall reconstruction will be designed and supervised by a professional stone mason.

A triangular traffic island at the Main Street approach to the intersection will be removed to provide the necessary additional cross section at the Main Street approach to the intersection. A cast iron directional sign will be removed from the traffic island and reset at the reconfigured corner of Main Street and Milford Street.

No roadway widening is proposed along northbound Hastings Street or westbound Main Street adjacent to Founders Park. The existing granite Milestone 37, dated 1785, on Hastings Street along the former Middle Post Road adjacent to Founders Park will remain in place behind the proposed new shared use path (SUP) and will be protected with temporary chain link fencing during construction. Milestone 37 is within the existing SHLO. An adjacent granite post, which appears to be a property line marker, also will be retained and will be protected behind the temporary fencing during construction. The SUP will be constructed with a 2'-wide buffer separating it from the milestone, which is considered adequate width to protect the milestone from snowplow strikes. The current plans enclosed with this submittal indicate that Milestone 37 will be removed and reset but those plans will be revised to indicate that the milestone will be retained in place and protected. MassDOT has prepared an Inventory Form C for Milestone 37, which is eclosed with this submittal.

Other Stonework. (Sheet 38) A pair of parallel stone masonry walls along a walkway in front of the c. 1908 Craftsman style dwelling at **#21 Hastings Street (MEN.63)** are partially within the existing SHLO. The two walls will be dissembled by a professional stone mason and reset on either side of the reconstructed walkway behind the proposed new sidewalk along southbound Hastings Street at that location. A special provision for Historic Stone Railing Walls Removed and Reset (Item 691.01, enclosed) will be included in the construction contract.

A set of three granite steps in front of the **South Parish Unitarian Church Parsonage (MEN.62)**, 17 Hastings Street, also will be removed and reset behind the proposed new sidewalk along southbound Hastings Street at that location. The granite steps are partially within the SHLO. A special provision for Granite Steps Removed and Relaid (Item 706.4, enclosed) will be included in the construction contract.

Archaeological Assessment

A review of the MHC's archaeological maps in MACRIS revealed four recorded pre-contact sites in the vicinity of the project area.

- Site 19-WR-107 is an unnamed site recorded 0.25-miles southwesterly of the Uxbridge Rd. / Taft Ave. intersection.

- Site 19-WR-673 (Nextel Tower Site) is an isolated flake scatter identified in 2000 as part of a cell tower survey. This site is recorded approximately 0.15-miles southwesterly of the Uxbridge Rd. / Taft Ave. intersection. No diagnostic artifacts were recovered, and the site was determined to be not significant.
- Site 19-WR-1130 (321w-3 Site) is an isolated flake scatter identified in 2017 as part of a National Grid feeder pole location survey. The site is recorded approximately 0.25-miles northwesterly of the Uxbridge Rd. / Hartford Ave. intersection.
- Site 19-WR-798 (Upton State Forest Site) is a find spot identified in advance of gas line surveys conducted 1989 and 1991. The site is recorded near Dudley Road approximately 0.25-miles northerly of the current project area.

An additional archaeological survey was conducted in 1987 immediately west of the current project area in advance of Hartford Avenue reconstruction work. The survey identified four historic sites and no pre-contact sites. The historic sites are recorded in the Town of Uxbridge well outside of the current project's APE.

Although undisturbed areas near Nipmuc Pond and Muddy Brook may be sensitive for archaeological resources, it is the opinion of the MassDOT Archaeologist, Jameson Harwood, that the Uxbridge Rd (Route 16) project's direct APE has low sensitivity for significant archaeological resources based on the results of previous archaeological surveys, the impacts of previous roadway, trolley line, sidewalk, utility, and drainage construction, roadside development, and unfavorable conditions (wetland / slope). The project work will be confined to disturbed / unfavorable areas within and immediately adjacent to the existing state highway layout.

Infiltration Basin at Uxbridge Rd / Hartford Ave Intersection (Station 205 to Station 210 LT on Sheets 31-32, 102-103, and 188 of the enclosed Construction Plans)

Drainage work between Station 205+00 LT and Station 210+00 LT will consist of the construction of an infiltration basin along the north side of Uxbridge Road and drainage ditch to the adjacent wetlands. A review of historic maps and aerials indicates this location has been modified throughout the early 20th century. A review of the 1908 USGS map shows a short section of rail line near the western end of the project area that curves from Nipmuc Pond northeasterly to Uxbridge Road. The Town of Mendon's Open Space and Recreation Plan notes that the Milford and Uxbridge Trolley Line opened on December 20, 1901 to provide public access to a park at Nipmuc Pond. This section of rail line does not appear on 1919 USGS map.

The 1938 historic aerial and the 1944 USGS map shows the new alignment of Route 16/Uxbridge Road to the east of the Uxbridge Road / Hartford Avenue "T" intersection. This "T" intersection was bypassed and the former Uxbridge Road approach to Hartford Avenue was removed as it does not appear on the 1953 USGS map.

The 2013 Streetview image shows an overgrown paved driveway at the proposed location of the infiltration basin. The 1967 and 1971 aerials show cleared areas and a section of driveway/roadway along the north side of Uxbridge Road at this location. A further review of aerials indicates the cleared areas and roadway have become overgrown with vegetation throughout the late 20th and early 21st century.

Infiltration Basin (Station 268 RT to Station 270+50 RT on Sheets 42-43, 113-114, and 189 of the Construction Plans)

The proposed infiltration basin to be constructed along the south side of the roadway at 21 Milford St. (Route 16) between Station 268 RT to Sta 270 + 50 RT will upgrade an existing drainage swale.

Infiltration Basin (Station 274+50 RT)

The proposed drainage work near Station 274+50 will upgrade existing culverts and drainage structures near Muddy Brook. The infiltration basin will be along the toe of the roadway slope.

Section 4(f) Evaluation – Fee Takings and Permanent Easements – *de minimis* impact

This project requires minor fee takings and permanent easements on parcels occupied by properties that contribute to the National Register-listed **Mendon Center Historic District.** Any fee takings or easements that result in the permanent incorporation of land from a public or private historic site into a transportation facility is regarded as a transportation use and must be evaluated and approved under Section 4(f) of the National Transportation Act of 1966, as amended [23 CFR Part 774].

Fee takings are highlighted in blue on the enclosed ROW plans. The following fee takings are required along the southbound side of Hastings Street to create a consistent cross section of sidewalk construction.

- **Cook-Darling House (MEN.68),** 33 Hastings Street, Parcel 2-17 (62 sf).
- **G. A. Staples House (MEN.67),** 31 Hastings Street, Parcel 2-18 (4 sf).
- **Cook-Adams House (MEN.64),** 23 Hastings Street, Parcel 2-6 (46 sf).
- **Ebenezer Haywood-Davenport House (MEN.58),** 7 Hastings Street, Parcel 2-15 (1 sf).
- **Dr. John G. Metcalf House (MEN.55),** 3 Hastings Street, Parcel 2-5 (339 sf).

A fee taking also is required for traffic signal installation on the southbound side of Hastings Street across from the Maple Street intersection.

- **House at 21 Hastings Street (MEN.63),** Parcel 2-13 (20 sf).

Permanent utility easements (PUEs), highlighted in pink on the ROW plans, are required on parcels occupied by contributing properties within the National Register-listed Mendon Center Historic District. The PUEs are required for realignment of overhead utility wires or installation of utility poles with guy wires.

- **Cook-Darling House (MEN.68),** 33 Hastings Street, Parcel 2-PUE-2 (600 sf).
- **G. A. Staples House (MEN.67),** 31 Hastings Street, Parcel 2-PUE-3 (733 sf).
- **Cook-Adams House (MEN.64),** 23 Hastings Street, Parcel 2-PUE-24 (92 sf).
- **House at 21 Hastings Street (MEN.36),** Parcels 2-PUE-7 (28 sf) and 2-PUE-39 (70 sf).
- **Seth Hastings House (MEN.60),** 10 Hastings Street, Parcel 2-PUE-12 (968 sf).
- **Holland-Albee Bakery Worker House (MEN.59),** 8 Hastings St., Parcel 2-PUE-56 (38 sf).
- **Town of Mendon, Woods Civil War Memorial (MEN. 901),** Hastings Street at Maple Street, Parcel 2-PUE-5 (467 sf).\
- **Hayward-Taft House (MEN.106),** 38 Maple Street, Parcels 2-PUE-6 (592 sf) and 2-PUE-53 (40 sf).
- **D. Eames-Wallahan House (MEN.100),** 23 Maple Street, Parcel 2-PUE-34 (273 sf).
- **B. Anthony-Inman House (MEN.98),** 17 Maple Street, Parcel 2-PUE-10 (137 sf).
- **House at 34 Maple Street (MEN.105),** Parcel 2-PUE-38-T (48 sf).
- **House at 11 Milford Street (MEN.234),** Parcel 2-PUE-42 (67 sf).

Permanent drainage easements, highlighted in pink on the ROW plans, are required on parcels occupied by contributing properties within the National Register-listed Mendon Center Historic District. The drainage easements are required for construction of linear roadside drainage ditches.

- **Cook-Adams House (MEN.64),** 23 Hastings Street, Parcels 2-D-8 (660 sf) and 2-D-9 (213 sf).
- **House at 21 Hastings Street (MEN.36),** Parcels 2-D-10 (174 sf), 2-D-11 (368 sf), and 2-D-12 (131 sf).
- **South Parish Unitarian Church Parsonage (MEN.62),** 17 Hastings Street, Parcel 2-D-13 (506 sf).
- **Walter T. Metcalf House (MEN.61),** 15 Hastings Street, Parcel 2-D-14 (277 sf).
- **Ebenezer Haywood-Davenport House (MEN.58),** 7 Hastings St., Parcel 2-D-15 (249 sf).
- **Dr. John G. Metcalf House (MEN.55),** 3 Hastings Street, Parcel 2-D-17 (665 sf).

Permanent highway sign easements, highlighted in pink on the ROW plans, are required on parcels occupied by contributing properties within the National Register-listed Mendon Center Historic District. These easements are required for the installation of roadside highway signs.

- **B. Anthony-Inman House (MEN.98),** 17 Maple Street, Parcel 2-HS-2-T (8 sf).
- **Dr. John G. Metcalf House (MEN.55),** 3 Hastings Street, Parcel 2-HS-6 (6 sf).

It is MassDOT's expectation that the Federal Highway Administration (FHWA) will determine that the proposed permanent easements meet the criteria for a Section 4(f) *de minimis* finding, pursuant to 23 CFR 774.3(b). This project, therefore, does not require an individual Section 4(f) evaluation. This letter is intended to inform the State Historic Preservation Officer (SHPO) that this project is expected to qualify for a *de minimis* finding under Section 4(f) based on the concurrence of your office with this Section 106 finding of No Adverse Effect, pursuant to 23 CFR 774.5(b)(1)(ii).

Section 106 Effect Finding

It is MassDOT's opinion that the proposed resurfacing and widening of Route 16 in Mendon will have **No Adverse Effect** on the National Register-listed Mendon Center Historic District. MassDOT has designed the project to remain within the existing State Highway Layout to the greatest extent feasible, with minimal fee takings from parcels occupied by properties that contribute to the historic district. The existing paved roadway will be narrowed along Hastings Street to provide the necessary cross section to construct an 8'-wide shared use path along the northbound side of Route 16 without requiring any additional right of way in the historic district. All new traffic signal poles within the historic district will be powder coated black to make them less conspicuous. Seismographs will be installed in five dwellings along northbound Hastings Street within the historic district to monitor vibrations during construction that could be potentially harmful to the historic properties.

MassDOT will carefully remove the Woods Civil War Memorial from within the SHLO at the intersection of Hastings Street and Maple Street and relocate the memorial to an appropriate nearby location on the same parcel but entirely outside of the SHLO. Other stone features along Route 16 within the historic district, such as balance walls, retaining walls, railing walls, and stone slab steps, also will be carefully removed and reset outside of the SHLO or beyond the edge of pavement under the supervision of a professional stone mason. The 1785 Milestone 37 will remain in its current location within the SHLO adjacent to Founders Park and will be protected during construction. MassDOT has prepared an inventory form for Milestone 37, which is enclosed with this submittal.

MassDOT solicits your concurrence with this No Adverse Effect finding in accordance with Stipulation V.C.1 of the amended Section 106 Programmatic Agreement. A copy of this letter will be forwarded to the Federal Highway Administration as specified under the terms of the Programmatic Agreement. If you should have any questions, please feel free to contact me at 978-325-2094.

Sincerely,

Jeffrey Shrimpton
Program Engineer for Design
Environmental Services

c.c.: Mendon Historical Commission
Mendon Historic District Commission
Kenneth S. Miller, FHWA

encs: Locus Map
Construction & Right of Way Plans
Special provisions
Milestone 37 inventory form

FOR FHWA USE

MassDOT Request for Federal Highway Administration (FHWA) Approval

MassDOT Highway Division requests final approval from FHWA that the proposed "use" of the above-described Section 4(f) resources meets the criteria of a *de minimis* impact, as specified under 23 CFR 774.17.

KENNETH S MILLER

Digitally signed by KENNETH S MILLER
Date: 2025.01.22 07:01:29 -05'00'

Joi Singh, Division Administrator (or designee) Date
Federal Highway Administration
Massachusetts Division

Attachment C

Revised Permit Plans

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	20
PROJECT FILE NO.	608491		

TITLE SHEET & INDEX

PLAN AND PROFILE OF

UXBRIDGE ROAD, HASTINGS STREET, MILFORD STREET (ROUTE 16)

IN THE TOWN OF

MENDON

WORCESTER COUNTY

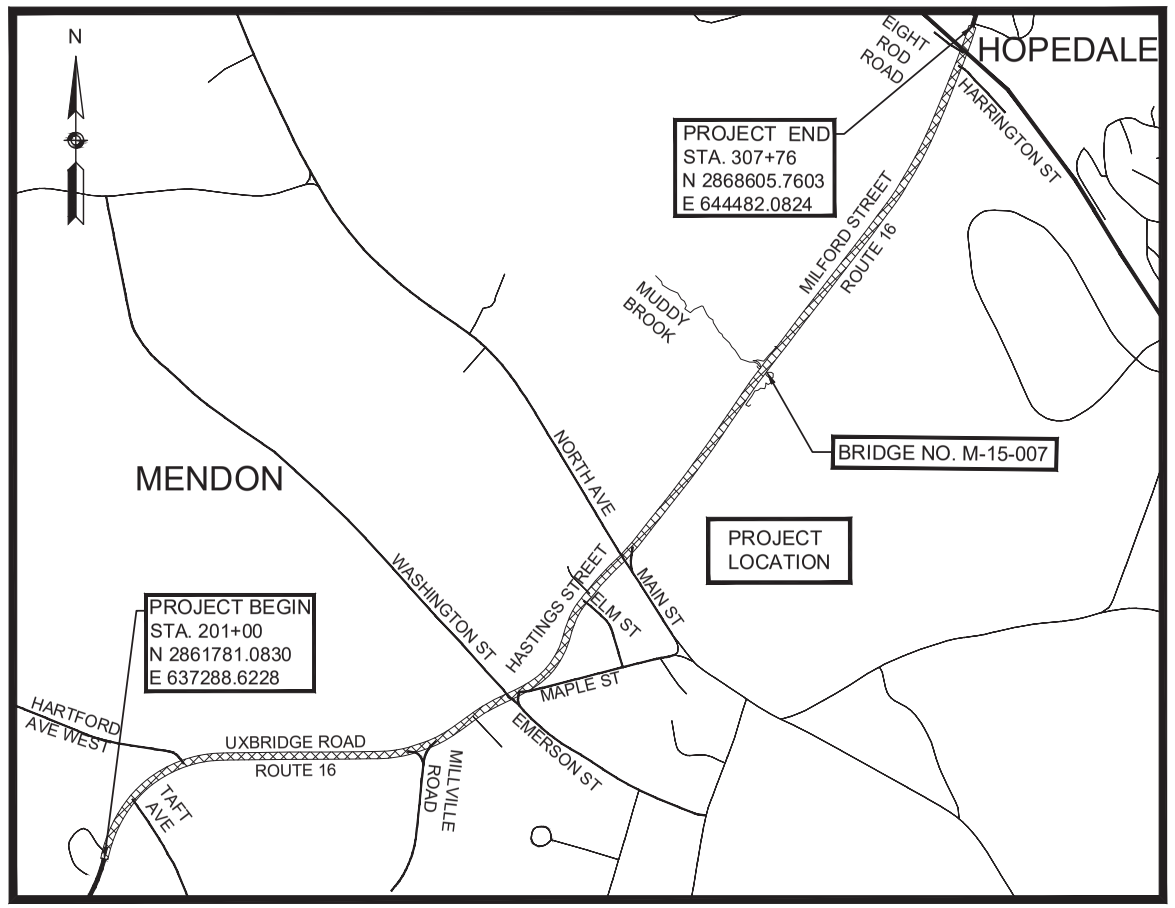
FEDERAL AID PROJECT NO.

USACE PCN PLANS

THESE PLANS ARE SUPPLEMENTED BY THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK.

INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET & INDEX
2	LEGEND & ABBREVIATIONS
3	GENERAL NOTES
4	KEY PLAN
5 - 25	CONSTRUCTION PLANS
26 - 28	CULVERT FLOOD SECTIONS
29 - 33	CULVERT PLANS
34	CONTROL OF WATER PLAN
35 - 38	CONSTRUCTION DETAILS



0 800 1600 2400 3200

SCALE: 1" = 800'

LENGTH OF PROJECT = 10,676.00 FEET = 2.022 MILES

DESIGN DESIGNATION (ROUTE 16)

DESIGN SPEED	STATION
45 MPH	STA. 201+00 TO STA. 239+00
40 MPH	STA. 239+00 TO STA. 261+00
50 MPH	STA. 261+00 TO STA. 301+00
45 MPH	STA. 301+00 TO STA. 307+75
ADT (2019)	18,300
ADT (2031)	19,300
K	8.0%
D	75.0% EB
T (PEAK HOUR)	3.2%
T (AVERAGE DAY)	2.9%
DHV	1,534
DDHV	1,145 EB
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL

DATE	DESCRIPTION	REV #
08/23/24	PS&E DESIGN SUBMISSION	0
02/23/24	100% DESIGN SUBMISSION	0
03/17/23	75% DESIGN SUBMISSION	0
07/30/21	25% DESIGN SUBMISSION	0

HNTB
31 ST. JAMES AVE SUITE 300
BOSTON, MA 02116

MassDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER **DATE**

Proposal No. 608491-131468
608491_EV1(TITLE & INDEX).DWG Plotted on 6-Feb-2026 8:29 PM
A00830 - 329

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
CO. BD.		HYDRANT
		LIGHT POLE
		COUNTY BOUND
		GPS POINT
C	C	CABLE MANHOLE
D	D	DRAINAGE MANHOLE
E	E	ELECTRIC MANHOLE
G	G	GAS MANHOLE
M	M	MISC MANHOLE
S	S	SEWER MANHOLE
T	T	TELEPHONE MANHOLE
MON	W	WATER MANHOLE
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
TB		MONUMENT
		STONE BOUND
		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UPL	UPL	UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		TREE PROTECTION
PM	PM	SWAMP / MARSH
WG	WG	WATER GATE
		PARKING METER
99		OVERHEAD CABLE/WIRE
100		CURBING
99		CONTOURS (ON-THE-GROUND SURVEY DATA)
		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
x	x	CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT CONTROL BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		ORDINARY HIGH WATER LINE
		BORDER OF WETLAND
		LIMIT OF 100 YEAR FLOODPLAIN
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING (REM)	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR
		VIDEO DETECTION ZONE
		VIDEO DETECTION CAMERA
		PEDESTRIAN PUSH BUTTON, SIGN, AND SADDLE
		EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		PEDESTRIAN SIGNAL HEAD
		SIGNAL POST AND BASE
		MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		SPAN POLE
		SIGN AND POST
		SIGN AND POST (2 POSTS)
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE (12"/24" WIDE)
	CW	CROSSWALK (12" WIDE)
	SWL	SOLID WHITE LINE (6" WIDE)
	SYL	SOLID YELLOW LINE (6" WIDE)
	BWL	BROKEN WHITE LINE (6" WIDE)
	BYL	BROKEN YELLOW LINE (6" WIDE)
	DWL	DOTTED WHITE LINE (6" WIDE, 3' LINE SEGMENT, 9' BREAKS)
	DYL	DOTTED YELLOW LINE (6" WIDE, 3' LINE SEGMENT, 9' BREAKS)
	DWLEx	DOTTED WHITE LINE EXTENSION (6" WIDE, 2' LINE SEGMENT, 6' BREAKS)
	DYLEx	DOTTED YELLOW LINE EXTENSION (6" WIDE, 2' LINE SEGMENT, 6' BREAKS)
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE
	YL	YIELD LINE
		BIKE LANE MARKING
		BIKE DETECTOR MARKING
		SHARED USE LANE MARKING
		1-WAY WHITE SLOTTED PAVEMENT MARKER
		2-WAY YELLOW/YELLOW SLOTTED PAVEMENT MARKER
		1-WAY YELLOW SLOTTED PAVEMENT MARKER

ALL PAVEMENT MARKINGS SHALL BE RECESSED POLYUREA UNLESS OTHERWISE SPECIFIED.

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ECCEN	ECCENTRIC
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
ER	EASTERN REDBUD
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
JCT	JUNCTION
L	LENGTH OF CURVE
LSA	LANDSCAPE AREA
LB	LEACH BASIN
LD	LONDON PLANETREE
LP	LIGHT POLE
LT	LEFT
LST	LOW SEATED TIMBER
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
NTS	NOT TO SCALE
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PCR	PEDESTRIAN CURB RAMP
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	20
PROJECT FILE NO.	608491		

LEGEND & ABBREVIATIONS

ABBREVIATIONS (cont.)

GENERAL

POT	POINT ON TANGENT
PRC	POINT ON REVERSE CURVE
PROJ	PROJECT
PROP	PROPOSED
PSB	PORTABLE SOIL BORROW
PT	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PVMT	PAVEMENT
PWW	PAVED WATERWAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SUP	SHARED USE PATH
SW	SIDEWALK
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TP	TREE PROTECTION
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

TRAFFIC SIGNAL ABBREVIATIONS

CAB	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY UPRAISED HAND
FDW	FLASHING UPRAISED HAND
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR YELLOW
FYL	FLASHING YELLOW LEFT ARROW
FYR	FLASHING YELLOW RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALKING PERSON
Y	STEADY CIRCULAR YELLOW
YL	STEADY YELLOW LEFT ARROW

Proposal No. 608491-131468

608491_EV2(LEGEND & ABBREVIATIONS).DWG Plotted on 6-Feb-2026 8:07 PM

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	20
PROJECT FILE NO.	608491		

GENERAL NOTES

GENERAL NOTES

1. THIS BASEMAPPING WAS PREPARED BY NITSCH ENGINEERING IN JULY-SEPTEMBER, 2018, UTILIZING VARIOUS SURVEY EQUIPMENT TO INCLUDE LEICA TPS 1200 TOTAL STATION, LEICA GS14 GPS AND TERRESTRIAL MOBILE LIDAR. FIELD UPDATES AND ADDITIONAL TOPOGRAHIC DATA WAS COLLECTED IN OCTOBER 2020.
2. WETLANDS WERE DELINEATED BY HNTB IN ACCORDANCE WITH THE 1987 UNITED STATES ARMY CORPS OF ENGINEERS WETLAND DELINEATION MANUAL BETWEEN AUGUST 7, 2020 AND OCTOBER 1, 2020. AND VERIFIED ON OCTOBER 4, 2023. WETLAND FLAGS WERE LOCATED BY HNTB UTILIZING EOS ARROW 100 GNSS GPS UNIT WITH SUBMETER ACCURACY.
3. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXISTING GRADES AND ELEVATIONS. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY GRADE DISCREPANCIES PRIOR TO CONSTRUCTION.
4. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION.
5. PEDESTRIAN AND VEHICLE ACCESS TO ABUTTING PREMISES WILL BE MAINTAINED AT ALL TIMES AS DIRECTED BY THE ENGINEER. EMERGENCY VEHICLE ACCESS SHALL BE MAINTAINED AT ALL TIMES.
6. CONTRACTOR SHALL BE LIMITED TO CONSTRUCTION ACTIVITIES WITHIN THE IDENTIFIED LIMITS OF WORK AS SHOWN ON THE PLANS, OR AS DIRECTED TO DO SO BY THE ENGINEER.
7. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FROM THE TOWN AND APPLICABLE AGENCIES PRIOR TO COMMENCING WORK.
8. CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITY SERVICES AND HIGHWAY LIGHTING THROUGHOUT CONSTRUCTION UNTIL AND UNLESS THEY ARE REPLACED PER THE CONTRACT.
9. ALL GRANITE CURB THAT IS REMOVED SHALL BE RESET OR DISCARDED AS REQUIRED BY THE ENGINEER. GRANITE CURB THAT IS TO BE RESET SHALL NOT BE RANDOMLY MIXED WITH NEW CURB, BUT SHALL BE RESET SO AS TO GIVE A UNIFORM APPEARANCE.
10. DEWATERING IS LIKELY TO BE REQUIRED AT THE MUDDY BROOK CULVERT EXTENSIONS AND WORK ON THE DRAINAGE IMPROVEMENTS. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EXTENT OF DEWATERING REQUIRED AND TO PROPOSE THE MOST APPROPRIATE METHODS AND MATERIALS FOR DEWATERING THAT WILL ULTIMATELY BE APPROVED BY THE MASSDOT PROJECT ENGINEER. PLANS AND CALCULATIONS FOR ALL WATER CONTROL MEASURES WILL BE DEVELOPED BY THE CONTRACTOR, STAMPED BY A PROFESSIONAL CIVIL ENGINEER REGISTERED IN THE COMMONWEALTH, AND SUBMITTED TO MASSDOT'S PROJECT ENGINEER FOR APPROVAL PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
11. ALL DEWATERING AND/OR PUMP-AROUND RELATED EARTHWORK WILL BE CONDUCTED IN SUCH A MANNER AS TO PREVENT POTENTIAL SILTATION AND CONTAMINATION OF THE WETLANDS AND WATERWAYS WITHIN THE PROJECT LIMITS. ANY PUMPING DISCHARGE WILL NOT BE ALLOWED TO ENTER DIRECTLY INTO STREAMS OR ADJACENT WETLAND RESOURCE AREAS. WATER FROM THE WORK AREA WILL BE PUMPED TO A SEDIMENT FILTER BAG, WHICH WILL BE PLACED IN AN UPLAND AREA AND ENCIRCLED WITH COMPOST FILTER TUBES OR STRAW WATTLES. DEWATERING WILL BE CAREFULLY MONITORED TO ENSURE THAT THE WATER IS NOT PUMPED FASTER THAN IT CAN BE TREATED AND WILL BE TIMED TO AVOID PERIODS OF HIGH FLOW. ALL FILTERED SEDIMENTS WILL BE REMOVED FROM THE PROJECT AREA AND DISPOSED OFF-SITE. ONCE ALL CONSTRUCTION IN DEWATERED AREAS IS COMPLETE, THE ENTIRE WATER CONTROL SYSTEM STRUCTURE WILL BE REMOVED FROM THE SITE.
12. CONTRACTOR TO REMOVE AND STACK EXIST TOWN OF MENDON BANNERS ON UTILITY POLES. CONTRACTOR TO LEAVE ALL BANNERS AND BRACKETS AT THE TOWN HIGHWAY DEPARTMENT, ADDRESS 66 PROVIDENCE ST. MENDON, MA. 01756

DRAINAGE NOTES

1. CONTRACTOR SHALL VERIFY THE LOCATION OF THE EXISTING DRAINAGE SYSTEMS THAT ARE SHOWN ON THE DRAINAGE PLANS. WHERE EXISTING DRAINAGE IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION, AND SIZE SHALL BE ACCURATELY DETERMINED AND THE CONTRACTOR SHALL CONFIRM WHETHER THE DRAINAGE SYSTEM IS STILL ACTIVE. THE INFORMATION SHALL BE FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT. ALL ACTIVE DRAINAGE SYSTEMS IN CONFLICT WITH THE PROPOSED WORK SHALL BE RELOCATED IN KIND IN SUCH A MANNER AS TO AVOID IMPACTS TO PROPOSED ITEMS AND UTILITIES AS WELL AS IMPACTS TO EXISTING ITEMS AND UTILITIES TO REMAIN. IF DRAINAGE SYSTEM IS FOUND TO BE INACTIVE IT SHALL BE REMOVED OR FILLED IN-PLACE PER THE APPROVAL OF THE ENGINEER.
2. NO EXISTING DRAINAGE SYSTEMS SHALL BE ABANDONED, PLUGGED OR REMOVED WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.
3. PRECAST DRAINAGE STRUCTURES SHALL COMPLY WITH ASTM C-478 (CIRCULAR MANHOLES AND CATCH BASINS) AND ASTM C-913 (RECTANGULAR MANHOLES AND CATCH BASINS) AND ALL APPLICABLE ASSOCIATED ASTM STANDARDS.
4. PRECAST CONCRETE RINGS OR NON-SHRINK GROUT SHALL BE USED FOR GRADE ADJUSTMENTS.
5. CONTRACTOR SHALL CLEAN AND MAKE FUNCTIONAL ALL EXISTING STRUCTURES AND PIPING WITHIN THE LIMIT OF WORK. ALL EXISTING AND/OR PROPOSED DRAINAGE STRUCTURES AND PIPES WITHIN THE LIMIT OF WORK SHALL AGAIN BE CLEANED PRIOR TO CONCLUSION OF THE CONTRACT.
6, SHOULD DAMAGE OF ANY KIND OCCUR TO EXISTING PIPES AND STRUCTURES, THE CONTRACTOR SHALL MAKE REPAIRS, AT HIS OR HER OWN EXPENSE, TO THE SATISFACTION OF THE ENGINEER AND UTILITY OWNER.
7. GRADING SHALL PROVIDE POSITIVE DRAINAGE TO ALL DRAIN INLET STRUCTURES.
8. DURING CONSTRUCTION, ALL STRUCTURES OF THE EXISTING SYSTEM AND NEW SYSTEM OF DRAINS SHALL BE PROTECTED AGAINST SEDIMENTATION AND DEBRIS.
9. ALL DRAINAGE STRUCTURES AND PIPING SHALL BE DESIGNED AND CONSTRUCTED TO WITHSTAND REQUIRED LOADING, AS SHOWN IN THE CONTRACT DOCUMENTS.
10. PROPOSED INVERTS ON PLANS ARE SHOWN FOR BIDDING PURPOSES ONLY. ACTUAL INVERT ELEVATIONS WILL BE CONFIRMED IN THE FIELD.
11. DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY, BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES THE ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY STRUCTURES BE ORDERED. ANY FIELD ADJUSTMENTS TO LINE & GRADE UP TO A DEPTH OF 5' SHALL BE INCLUDED IN THE COST OF THE PIPE. PIPE EXCAVATION GREATER THAN 5' WILL BE PAID UNDER CLASS B TRENCH EXCAVATION.

UTILITY NOTES

1. ALL UNDERGROUND UTILITIES AS SHOWN WERE COMPILED USING FIELD SURVEY INFORMATION AND AVAILABLE RECORD INFORMATION.
2. RECORD UTILITY INFORMATION FROM THE VARIOUS UTILITY COMPANIES AND PUBLIC AGENCIES, ARE APPROXIMATE ONLY AND ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD.
3. ALL UTILITY COMPANIES, PUBLIC AND PRIVATE MUST BE NOTIFIED, INCLUDING THOSE IN CONTROL OF UTILITIES NOT SHOWN ON THIS PLAN, (SEE CHAPTER 370, ACTS OF 1963, MASSACHUSETTS) PRIOR TO DESIGNING, EXCAVATING, BLASTING, INSTALLING, BACKFILLING, GRADING, PAVEMENT RESTORING OR REPAVING.
4. THE LOCATION OF EXISTING PIPES OR OTHER UNDERGROUND STRUCTURES OR PROPERTY LINES ARE NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL UNDERGROUND PIPES OR STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL CALL "DIG SAFE" (1-888-344-7233) 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS) PRIOR TO ANY EXCAVATION TO OBTAIN ACCURATE UTILITY LOCATIONS.
5. SUBSURFACE UTILITY LOCATIONS HAVE BEEN PLOTTED TO MEET UTILITY QUALITY LEVEL "C" AS DESCRIBED IN ASCE STANDARD 38-02 AND SUMMARIZED HERE. THE UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS BASED ON ABOVE-GROUND FIELD OBSERVATION AND EXISTING RECORD INFORMATION RECEIVED FROM UTILITY STAKE-HOLDERS.
6. IN ACCORDANCE WITH MGL CHAPTER 82, SECTION 40, 40A-40E INCLUDING AMENDMENTS, THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES, TOWN OF MENDON AND HOPEDALE, AND GOVERNMENT AGENCIES INCLUDED IN THIS PROJECT IN WRITING PRIOR TO ANY EXCAVATION WORK. CALL "DIG SAFE" AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK.
7. INVERTS SHOWN ON PLAN ARE NOT GUARANTEED TO BE ACCURATE. DUE TO THE LIMITATIONS OF FIELD OBSERVATION AND SURVEY TECHNIQUES THE INVERTS ARE SHOWN AS APPROXIMATE ONLY AND SHALL NOT BE WARRANTED TO BE CORRECT. ADDITIONAL FIELD INVESTIGATION IS NECESSARY WHERE ACCURATE MEASUREMENTS ARE REQUIRED FOR DESIGN OF CRITICAL AREAS.
8. THE EXISTING CONDITIONS PLAN IS TO BE USED FOR THE SPECIFIED PROJECT ONLY AND IS NOT WARRANTED TO BE COMPLETE FOR ANY OTHER FUTURE PROJECTS.
9. CONTRACTOR SHALL CONDUCT SUBSURFACE INVESTIGATIONS TO IDENTIFY GROUND WATER ELEVATION PRIOR TO CONSTRUCTION.
10. TREE TRIMMING AND SELECTIVE THINNING SHOULD OCCUR AT ANY NEW UTILITY POLE AND PROVIDE 10' CLEAR WIDTH OF ALL OVERHEAD WIRES (OHW). CONTRACTOR TO CONFIRM CLEARING AND TREE TRIMMING LIMITS TO MINIMIZE TRIMMING TO THE MAXIMUM EXTENT POSSIBLE. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.

SURVEY NOTES

1. THE HORIZONTAL DATUM SHOWN HEREON REFERENCES THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MAINLAND ZONE, NAD83(2011) EPOCH 2010.0 IN US SURVEY FOOT.
2. THE VERTICAL DATUM SHOWN HEREON REFERENCES NAVD88, GEOID 12B.
3. GROUND CONTROL PROVIDED BY MASSDOT.
4. ABUTTERS PROPERTY LINES DEPICTED HEREON ARE APPROXIMATE ONLY AND ARE BASED A COMPILATION OF RECORD DEEDS AND PLANS.
5. THE BASE PLAN WAS PREPARED WITHOUT THE BENEFIT OF A TITLE SEARCH AND MAY NOT DISCLOSE ANY MATTERS THAT MAY BE REVEALED BY ONE.
6. THE BASE PLAN DOES NOT SHOW UNWRITTEN OR UNRECORDED EASEMENTS WHICH MAY EXIST. A REASONABLE AND DILIGENT ATTEMPT HAS BEEN MADE TO OBSERVE ANY APPARENT AND VISIBLE USES OF THE LAND. THE BASE PLAN DOES NOT GUARANTEE THAT NO SUCH EASEMENTS EXIST.
7. LEGAL STATUS OF EASEMENTS, WAYS AND RESTRICTIONS NOT DETERMINED BY THE SURVEY.
8. TITLE TO LAND IN THE ABUTTING WAYS IS NOT SHOWN AND HAS NOT BEEN DETERMINED AS A RESULT OF THE SURVEY.
9. THE RIGHT-OF-WAY LINES AND BASELINES SHOWN ON THE BASE PLAN ARE BASED ON STATE HIGHWAY LAYOUTS. THE MONUMENTS FOUND MARKING THE LAYOUT PLAN WERE FIELD LOCATED AND USED TO ESTABLISH THE RIGHT-OF-WAY LINES UTILIZING A BEST FIT SOLUTION.
10. DASHED BUILDING LINES ARE FROM MASSGIS AND ARE SHOWN FOR GRAPHICAL REFERENCE ONLY.

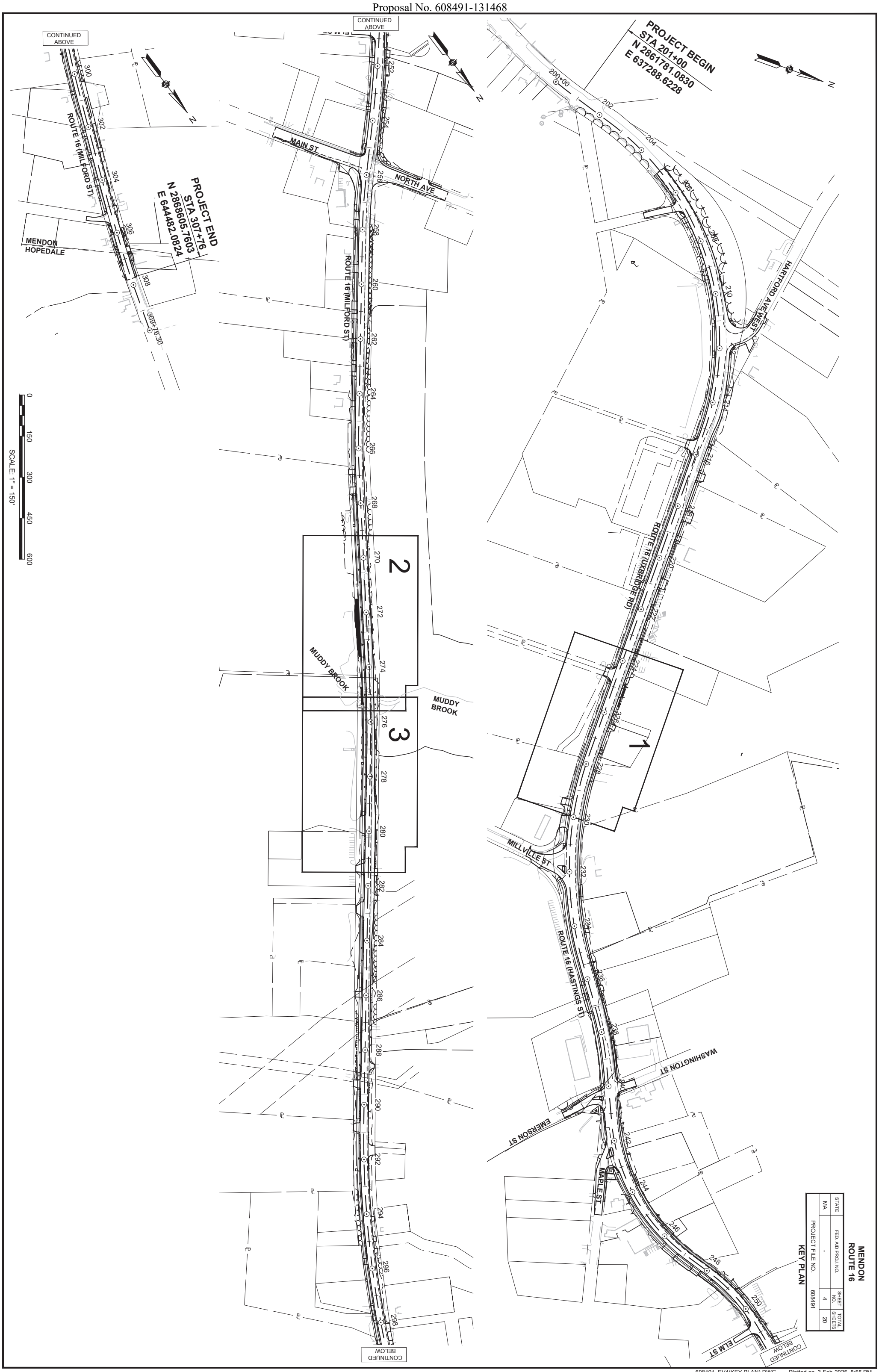
TRAFFIC NOTES

1. THE MINIMUM MOUNTING HEIGHT OF POST-MOUNTED SIGNS, MEASURED VERTICALLY FROM THE BOTTOM OF THE SIGN TO THE TOP OF THE CURB OR SIDEWALK, OR THE ELEVATION OF THE NEAR EDGE OF THE TRAVELED WAY, SHALL BE 7 FEET NEAR SIDEWALK AND 8 FEET NEAR SHARED USE PATH UNLESS OTHERWISE SPECIFIED ON THE PLANS.
2. TRAFFIC SIGNAL CONDUIT SHALL BE 3" SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.

Proposal No. 608491-131468

608491_EV3(GENERAL NOTES).DWG Plotted on 3-Feb-2026 8:48 PM

A00830 - 331



MENDON
ROUTE 16
KEY PLAN

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	20
PROJECT FILE NO.	608491		

608491_EV4(KEY PLAN).DWG Plotted on 3-Feb-2025 8:55 PM

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
P1	PERMANENT IMPACTS TO OHWM DUE TO SIDEWALK INSTALLATION, HMA DRIVEWAY AND DRAINAGE WORK	HNTB-G	41 LF
P2	PERMANENT IMPACTS TO WATERS OF THE UNITED STATES DUE TO DRAINAGE RECONSTRUCTION	HNTB-G	73 SQ. FT.
T1	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO DEWATERING ACTIVITIES	HNTB-G	10 SQ. FT.
T2	TEMPORARY IMPACTS TO OHWM DUE TO DEWATERING ACTIVITIES	HNTB-G	13 LF
T3	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO DEWATERING ACTIVITIES	HNTB-G	141 SQ. FT.
T4	TEMPORARY IMPACTS TO OHWM DUE TO DEWATERING ACTIVITIES	HNTB-G	99 LF

NOTE:
CONTRACTOR TO PROVIDE A CONTROL OF WATER PLAN FOR ALL DEWATERING ACTIVITIES AROUND THE INTERMITTENT STREAM. PLANS SHALL BE COORDINATED AND APPROVED BY MASSDOT AND THE TOWN OF MENDON.

LEGEND:
- TEMPORARY IMPACT TO LIMIT OF OHWM
- PERMANENT IMPACT TO LIMIT OF OHWM
- TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES
- PERMANENT IMPACT TO WATERS OF THE UNITED STATES
- WETLAND DELINEATION LINES
- LIMIT OF OHWM DELINEATION LINES
- LIMIT OF 100-YR FLOOD ZONE

SCALE: 1" = 40'
0 40 100 160

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	20
PROJECT FILE NO. 608491			

CONSTRUCTION PLANS
SHEET 1 OF 3

608491_EV6(CONST PLANS-NOI).DWG Plotted on 20-Feb-2025 2:40 PM

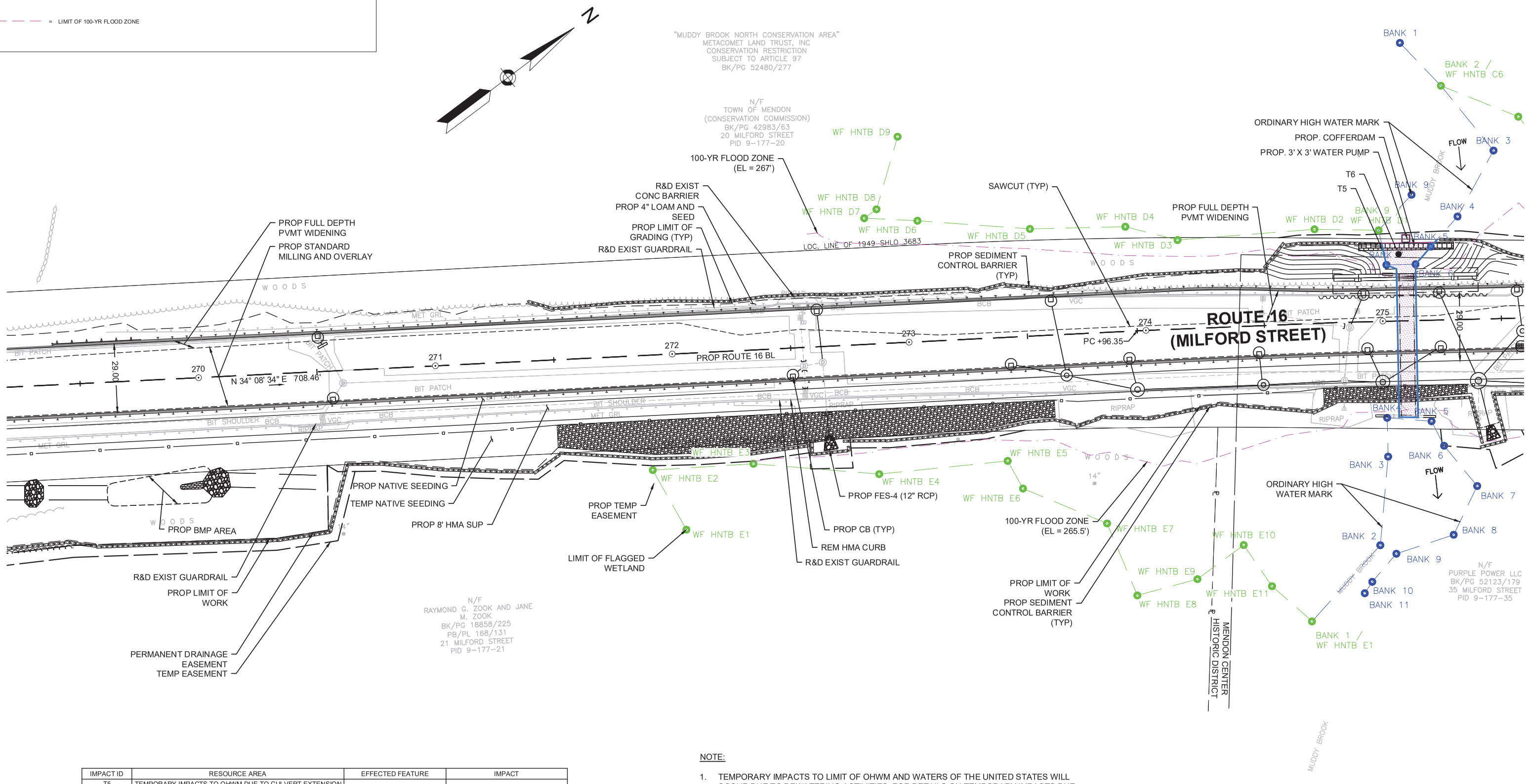
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	20
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 2 OF 3

LEGEND:

- = TEMPORARY IMPACT TO LIMIT OF OHWM
- = PERMANENT IMPACT TO LIMIT OF OHWM
- = TEMPORARY IMPACT TO WATERS OF THE UNITED STATES
- = PERMANENT IMPACT TO WATERS OF THE UNITED STATES
- = WETLAND DELINEATION LINES
- = LIMIT OF OHWM DELINEATION LINES
- = LIMIT OF 100-YR FLOOD ZONE



IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T5	TEMPORARY IMPACTS TO OHWM DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	163 LF
T6	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	691 SQ. FT

NOTE:

1. TEMPORARY IMPACTS TO LIMIT OF OHWM AND WATERS OF THE UNITED STATES WILL OCCUR DUE TO DEWATERING ACTIVITIES. FOR DETAILS ON TEMPORARY IMPACTS DUE TO DEWATERING, PLEASE SEE SHEET 16.
2. EROSION AND SEDIMENT CONTROLS SHALL TIE INTO INSTALLED COFFERDAM AT THE LIMIT OF DEWATERING.

0 40 100 160

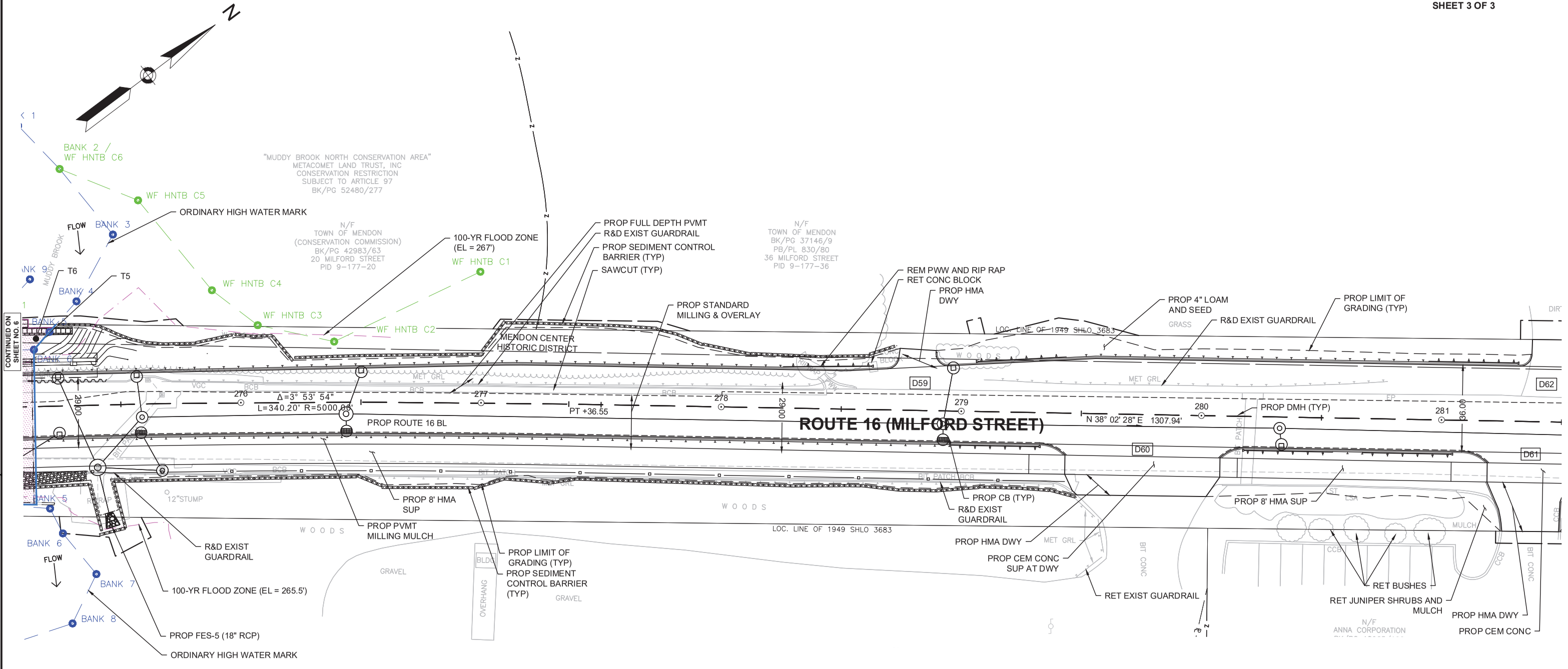
SCALE: 1" = 40'

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	20
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 3 OF 3

608491_EV6(CONST PLANS-NOI).DWG Plotted on 20-Feb-2025 2:44 PM



0 40 100 160

SCALE: 1" = 40'

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T5	TEMPORARY IMPACTS TO OHWM DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	163 LF
T6	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	691 SQ. FT

NOTE:

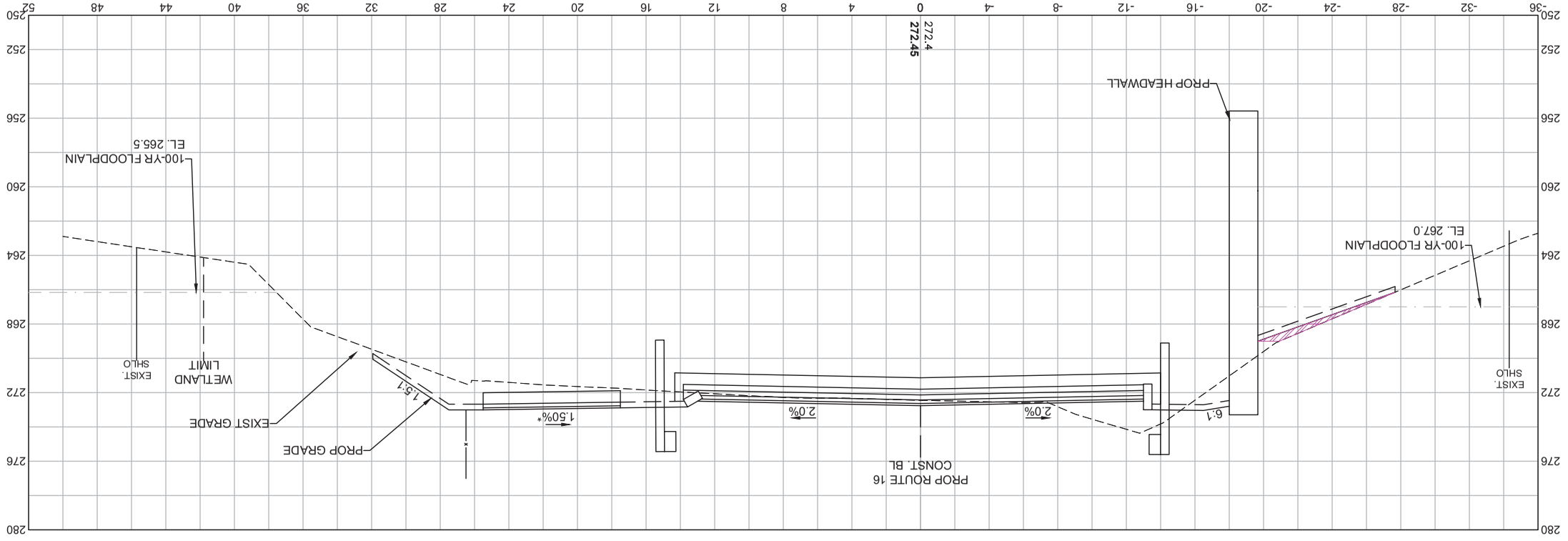
1. TEMPORARY IMPACTS TO LIMIT OF OHWM AND WATERS OF THE UNITED STATES WILL OCCUR DUE TO DEWATERING ACTIVITIES. FOR DETAILS ON TEMPORARY IMPACTS DUE TO DEWATERING, PLEASE SEE SHEET 16.
2. EROSION AND SEDIMENT CONTROLS SHALL TIE INTO INSTALLED COFFERDAM AT THE LIMIT OF DEWATERING.

LEGEND:

- = TEMPORARY IMPACT TO LIMIT OF OHWM
- = PERMANENT IMPACT TO LIMIT OF OHWM
- = TEMPORARY IMPACT TO WATERS OF THE UNITED STATES
- = PERMANENT IMPACT TO WATERS OF THE UNITED STATES
- = WETLAND DELINEATION LINES
- = LIMIT OF OHWM DELINEATION LINES
- = LIMIT OF 100-YR FLOOD ZONE

NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND
SEEDED WITH UPLAND SEED MIX

LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN



HOR. SCALE IN FEET
8 0 8 16

VER. SCALE IN FEET
8 0 8 16

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	20
PROJECT FILE NO. 608491			

CULVERT FLOOD SECTIONS
SHEET 1 OF 3

Proposal No. 608491-131468

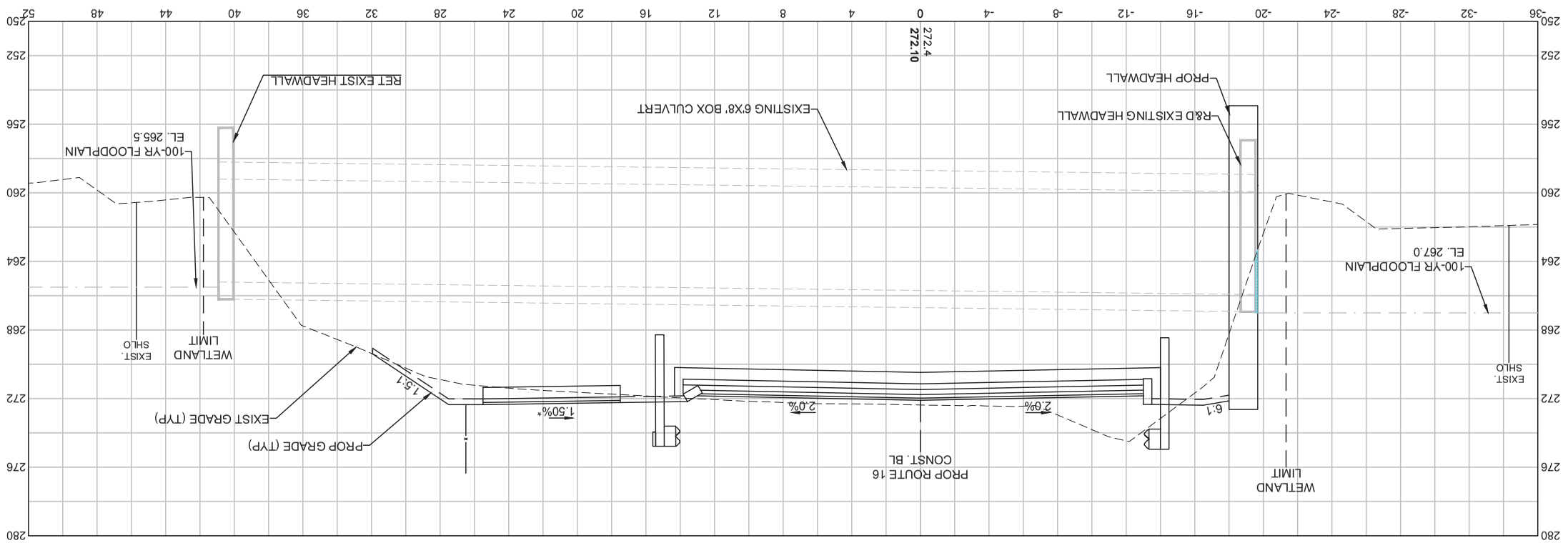
A00830 - 336

608491_EV8(FLOODSTORAGE).DWG Plotted on 3-Feb-2025 10:12 PM

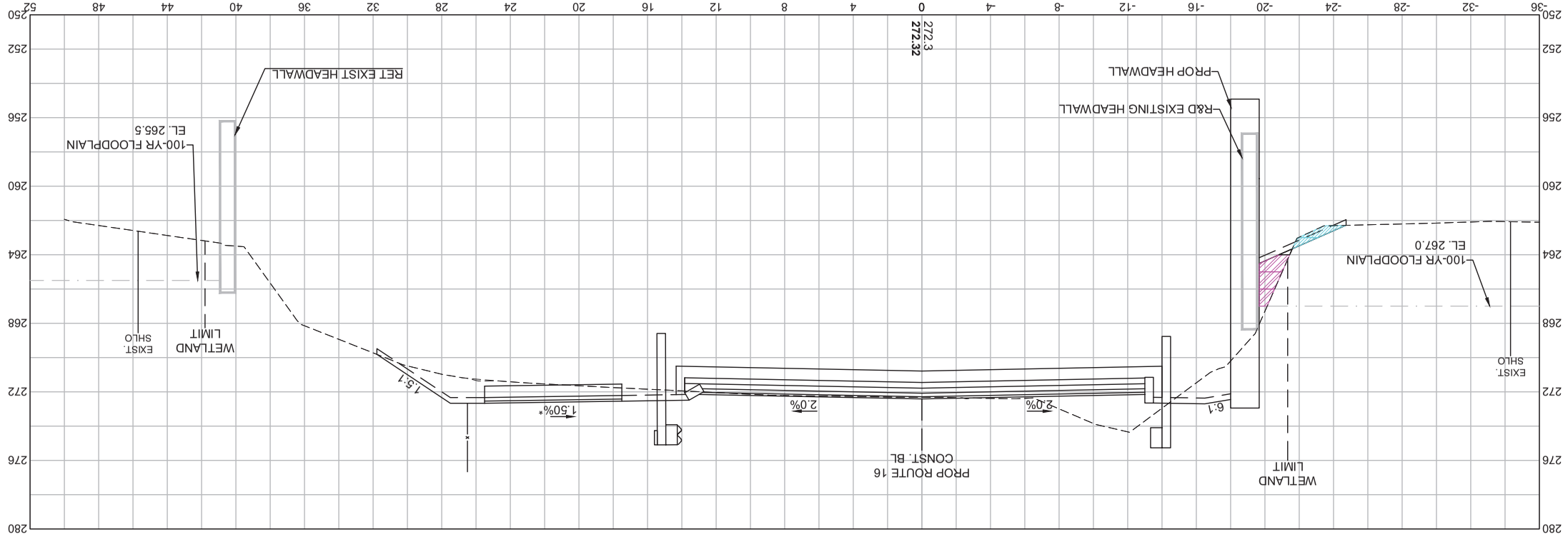
NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND SEEDED WITH UPLAND SEED MIX

LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN

275+12



275+20



HOR. SCALE IN FEET
8 0 8 16

VER. SCALE IN FEET
8 0 8 16

MENDON
ROUTE 16

CULVERT FLOOD SECTIONS
SHEET 2 OF 3

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	20
PROJECT FILE NO. 608491			

608491_EV8\FLOODSTORAGE1.DWG Plotted on 3-Feb-2025 10:12 PM

A00830 - 337

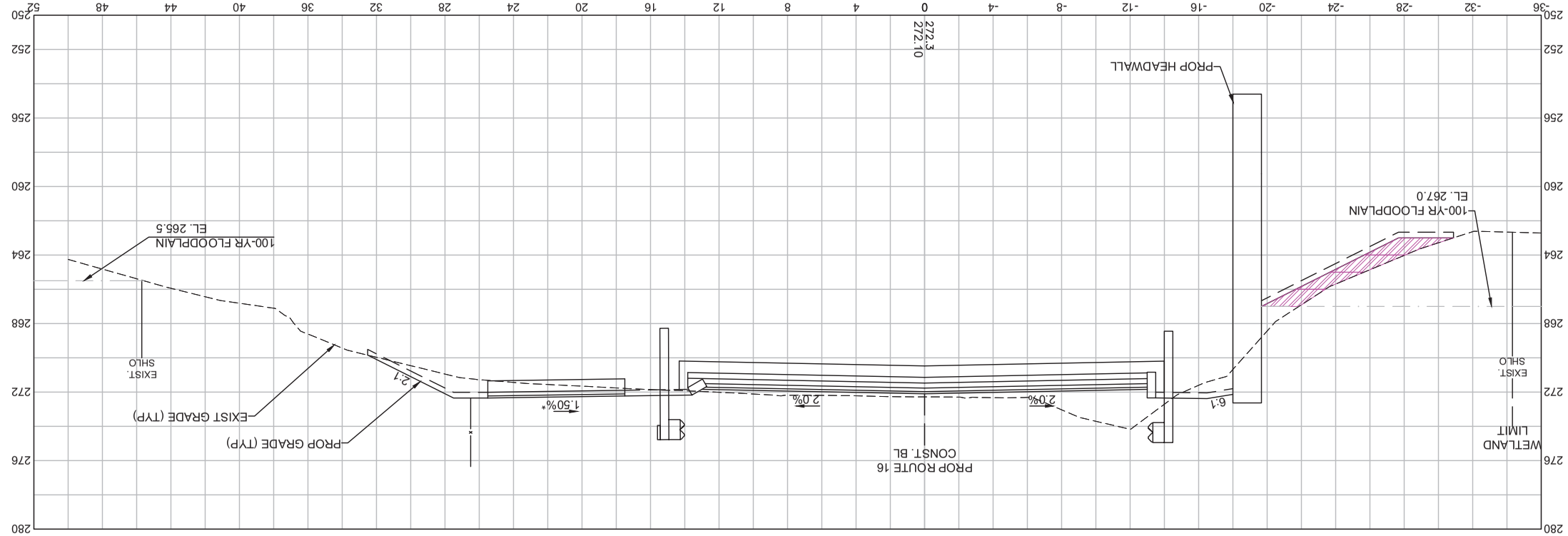
Proposal No. 608491-131468

NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND SEEDED WITH UPLAND SEED MIX

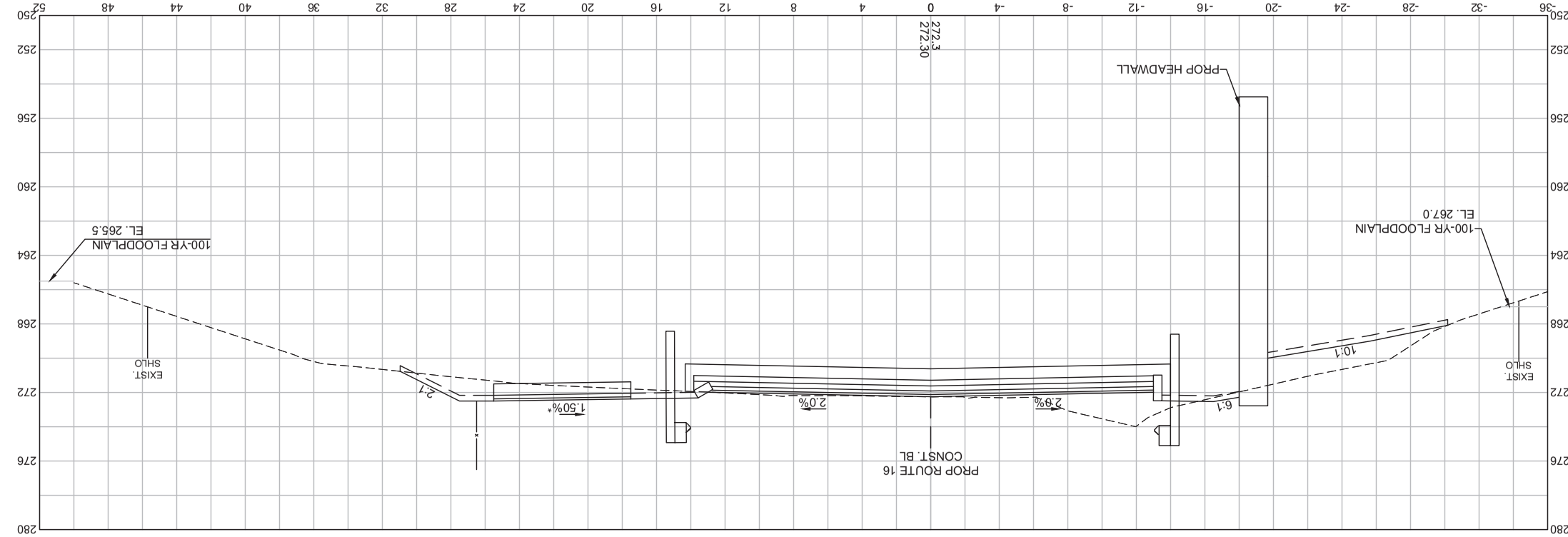
LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN

HOR. SCALE IN FEET
8 0 8 16
VER. SCALE IN FEET
8 0 8 16

275+30



275+40



MENDON
ROUTE 16

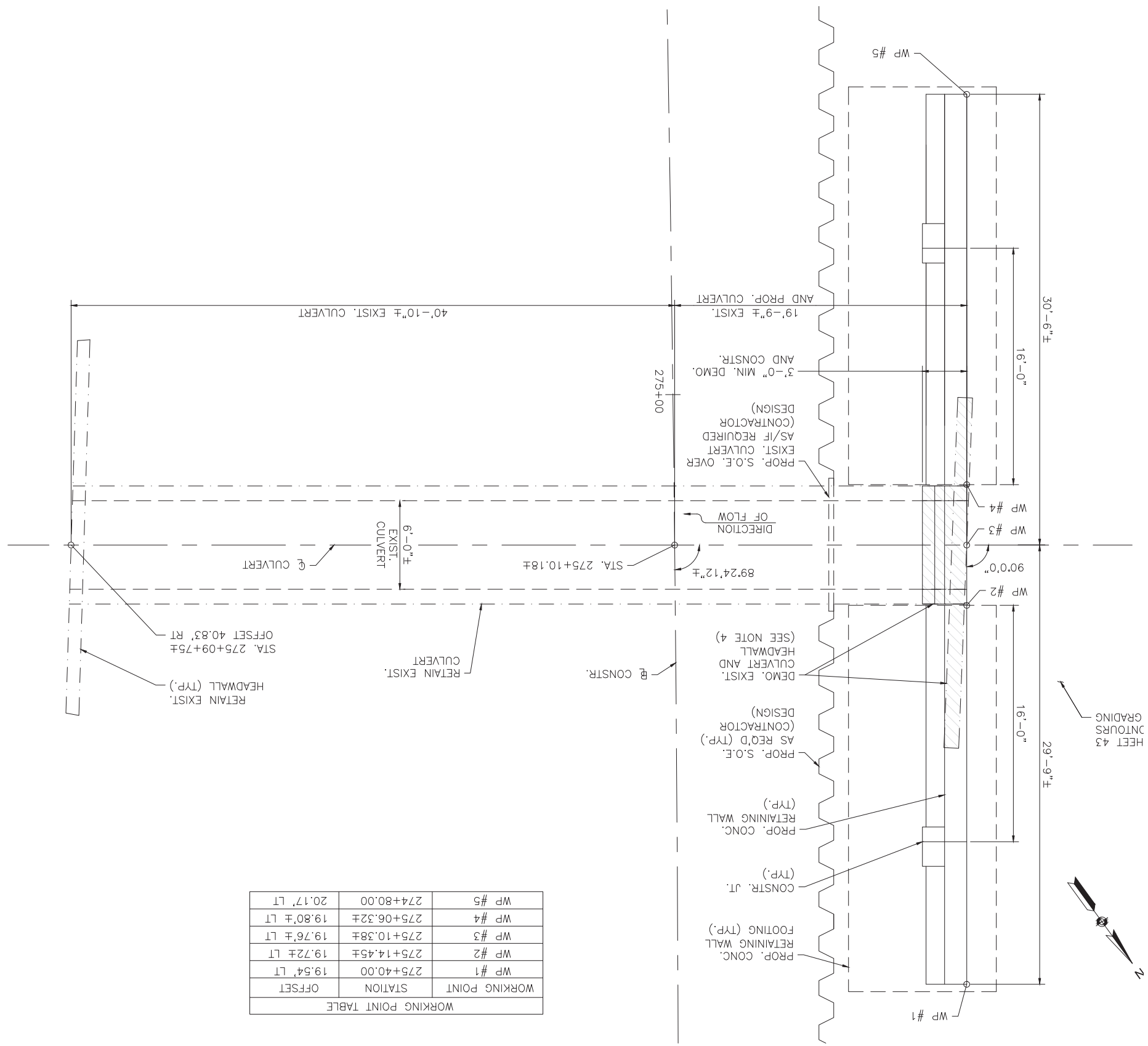
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	20
PROJECT FILE NO. 608491			

CULVERT FLOOD SECTIONS
SHEET 3 OF 3

608491_EV8\FLOODSTORAGE1.DWG Plotted on 3-Feb-2025 10:12 PM

MUDDY BROOK CULVERT PLAN

SCALE $\frac{1}{4}$" = 1'-0"



WORKING POINT TABLE		
WORKING POINT	STATION	OFFSET
WP #1	275+40.00	19.54' LT
WP #2	275+14.45±	19.72± LT
WP #3	275+10.38±	19.76'± LT
WP #4	275+06.32±	19.80'± LT
WP #5	274+80.00	20.17' LT

NOTES:

1. SUPPORT OF EXCAVATION (SHEETING, PILES, ETC.) SHALL BE CUT OFF A MINIMUM OF 2 FEET BELOW PROPOSED GRADE IF LEFT IN PLACE.
2. SEE SHEET 32 FOR RETAINING WALL DETAILS.
3. SEE SHEET 34 FOR CONTROL OF WATER DETAILS AND HYDRAULIC DATA.
4. LIMITS OF EXISTING RETAINING HEADWALLS AND ANY ASSOCIATED FOOTINGS BELOW GRADE ARE UNKNOWN. SUPPORT OF EXCAVATION AS SHOWN MAY REQUIRE MODIFICATION TO AVOID CONFLICTS WITH EXISTING STRUCTURE.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE AND PROTECTION OF UNDERGROUND UTILITIES AND/OR STRUCTURES IN THE AREA OF CONSTRUCTION.

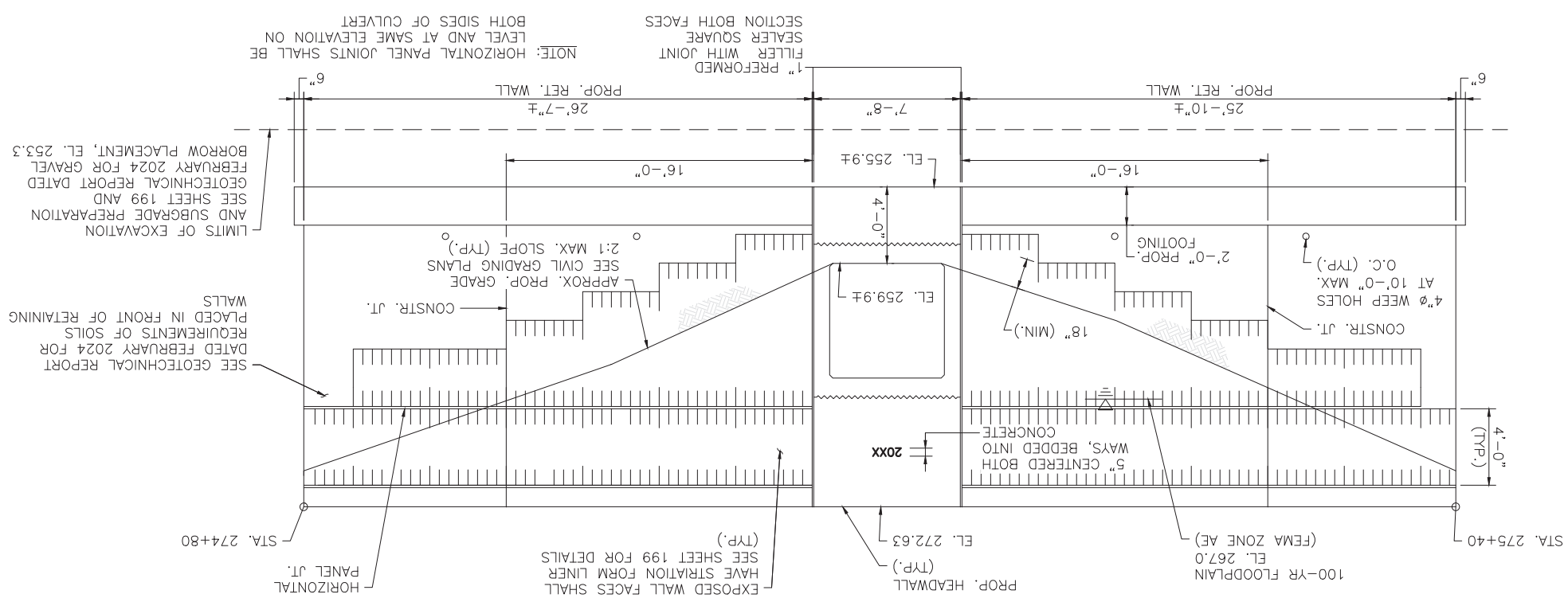
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	20
PROJECT FILE NO. 608491			

CULVERT PLAN

MUDDY BROOK CULVERT WEST ELEVATION

SCALE ¼" = 2'-0"



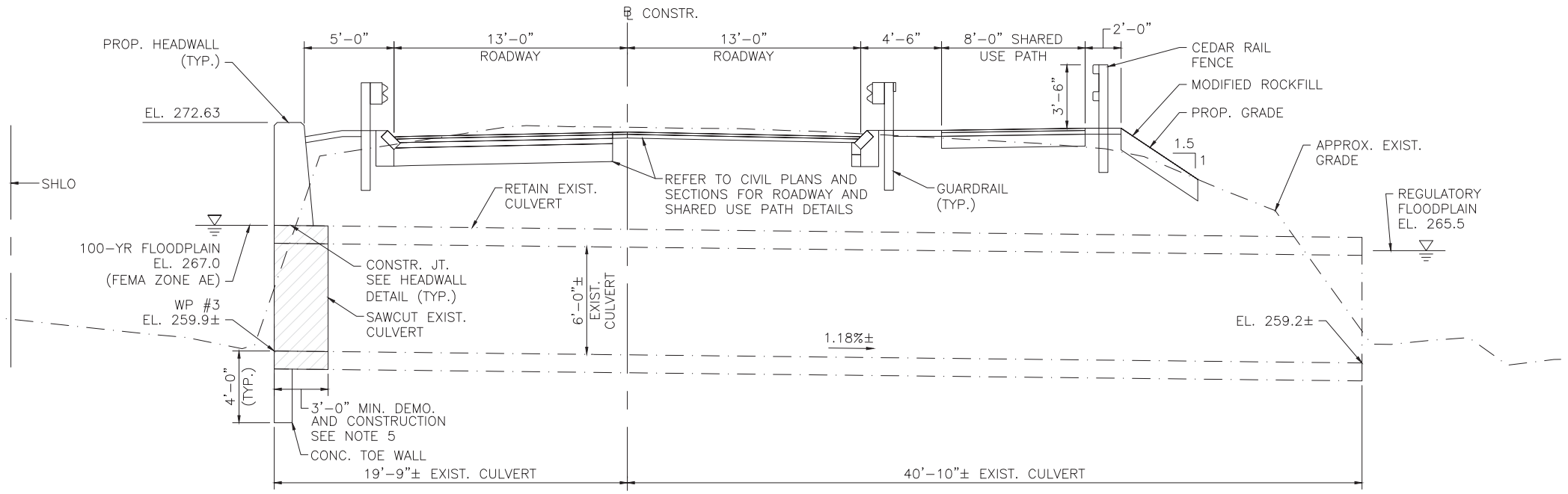
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	20
PROJECT FILE NO. 608491			

CULVERT ELEVATIONS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	13	20
PROJECT FILE NO.	608491		

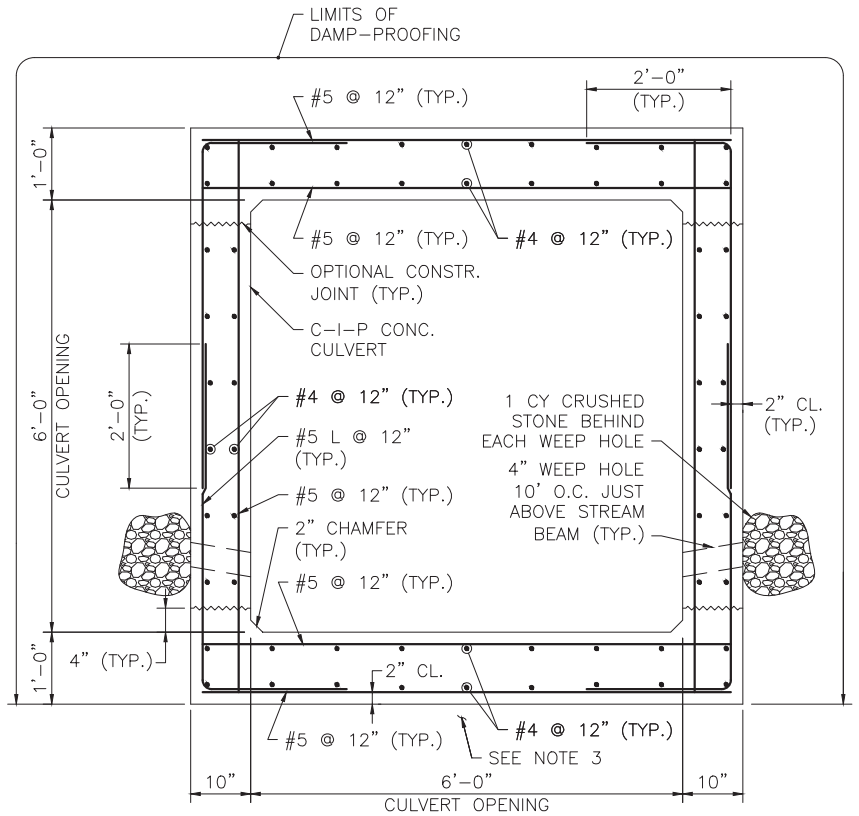
CULVERT LONG. SECTION AND DETAILS



MUDDY BROOK LONGITUDINAL SECTION
(LOOKING UP STATION)
SCALE ¼" = 1'–0"

NOTES:

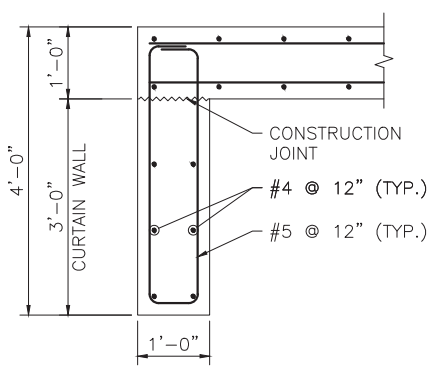
1. ALL CONCRETE SHALL BE 4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE.
2. CULVERT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
3. TRANSVERSE REINFORCEMENT SHALL BE PLACED NORMAL TO THE CENTERLINE OF THE CULVERT.
4. DEMOLITION OF EXISTING CULVERT AT THE EAST END SHALL EXTEND A MINIMUM OF 3'-0" AS SHOWN. CULVERT DEMOLITION SHALL EXTEND TO SOUND CONCRETE SECTION BEYOND THE LIMITS OF CRACKING AND SPALLING TO THE EXISTING CULVERT.



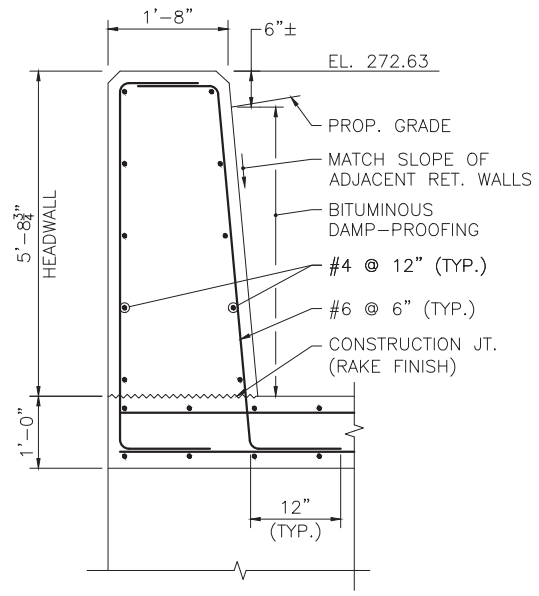
NOTES:

1. MAXIMUM FACTORED BEARING PRESSURE = 3 KSF.
2. FACTORED BEARING RESISTANCE = 6 KSF.

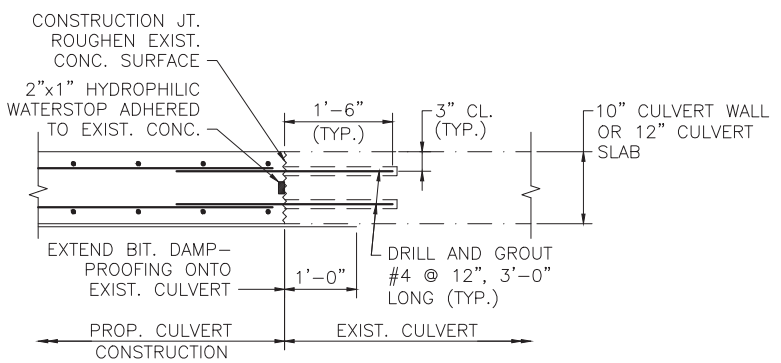
PROPOSED CULVERT SECTION
SCALE ¾" = 1'–0"



CURTAIN WALL DETAIL
SCALE ¾" = 1'–0"



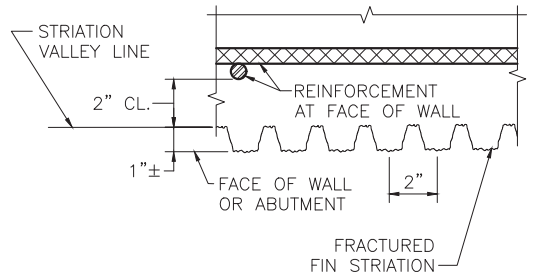
HEADWALL DETAIL
SCALE ¾" = 1'–0"



EXISTING CULVERT CONNECTION
SCALE ¾" = 1'–0"

Proposal No. 608491-131468
A00830 - 341
608491_EV7.3(CULVERT LONG SECTION).DWG Plotted on 3-Feb-2025 10:27 PM

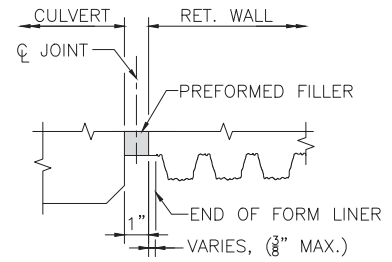
Proposal No. 608491-131468
608491_EV7.22(CULVERT MISC).DWG Plotted on 3-Feb-2025 11:51 PM
A00830 - 342



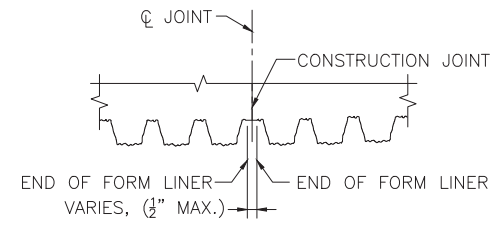
NOTES:

1. THE CONTRACTOR SHALL MAKE SURE THAT THE STRIATION FINS ARE PLUMB AND LINED UP VERTICALLY FROM PANEL TO PANEL FOR THE FULL HEIGHT OF THE WALL.
2. THE HORIZONTAL JOINT MAY BE OMITTED IF THE CONTRACTOR CAN DEMONSTRATE THAT THE FORM LINER PANELS CAN BE INSTALLED END TO END WITHOUT CREATING A VISIBLE SEAM IN THE FINAL CAST CONCRETE.

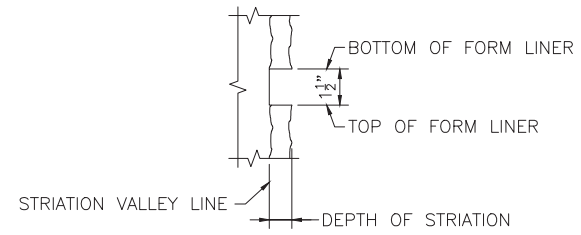
TYPICAL STRIATION DETAIL
SCALE: 3" = 1'-0"



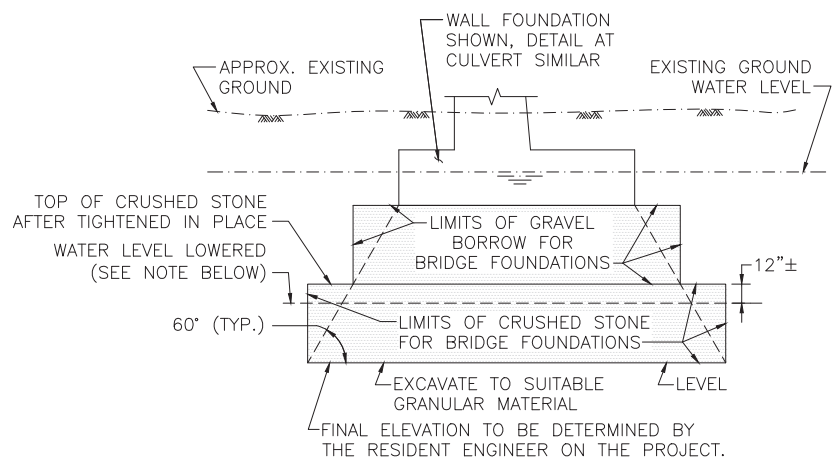
EXPANSION JOINT
SCALE: 3" = 1'-0"



CONSTRUCTION JOINT
SCALE: 3" = 1'-0"



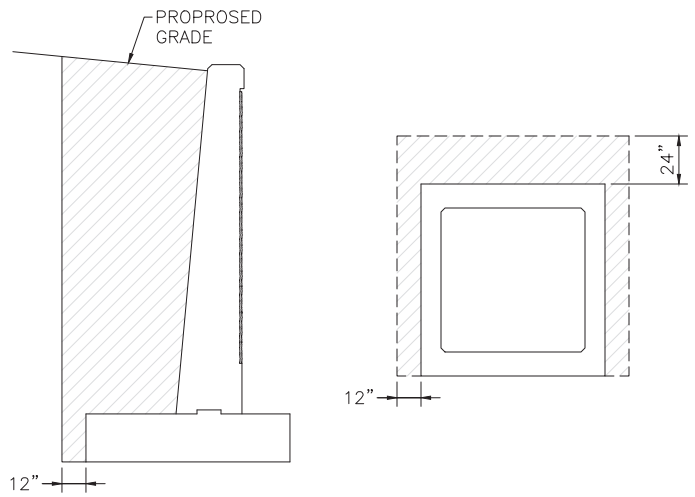
HORIZONTAL PANEL JOINT
SCALE: 3" = 1'-0"



NOTES:

1. LOWER WATER LEVEL AS MUCH AS POSSIBLE WITHOUT DISTURBING THE GRANULAR SOIL (SIDES AND BOTTOM) AND TIGHTEN THE CRUSHED STONE IN PLACE (SEE STANDARD SPECIFICATIONS).
2. REPLACE SOILS ABOVE ELEVATION 253.3 FEET BELOW PROPOSED CULVERT AND CULVERT RETAINING WALL FOUNDATIONS WITH CRUSHED STONE AND OR GRAVEL BORROW AS SHOWN AND PER SPECIFICATIONS.

LIMITS OF CRUSHED STONE AND GRAVEL BORROW FOR WALL AND CULVERT FOUNDATIONS
N.T.S.

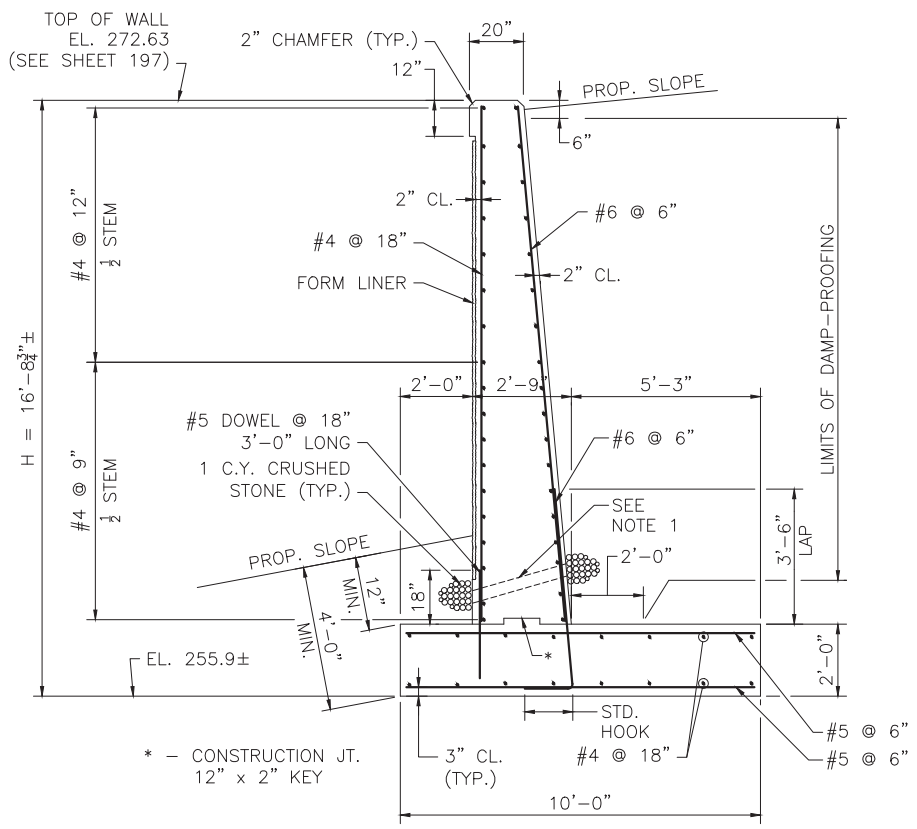


RETAINING WALL CULVERT EXTENSION

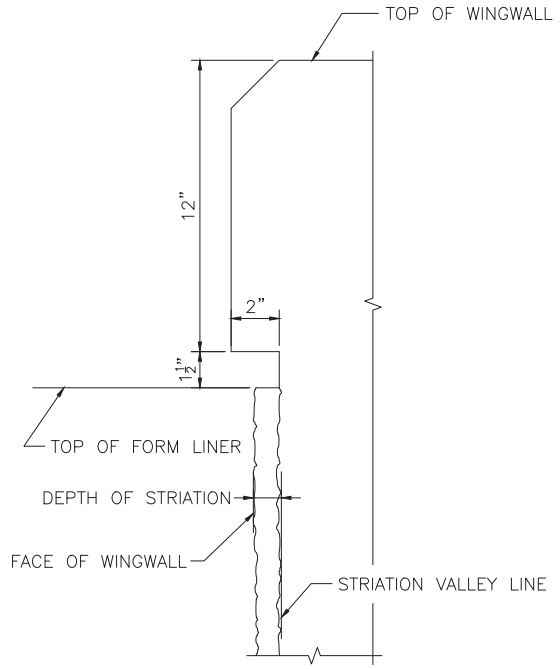
LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES
N.T.S.

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	15	20
PROJECT FILE NO.	608491		

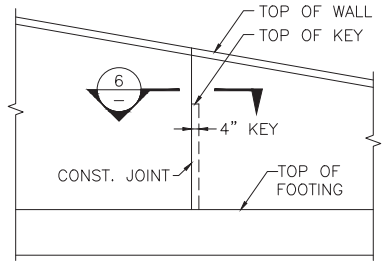
CULVERT RETAINING WALL DETAILS



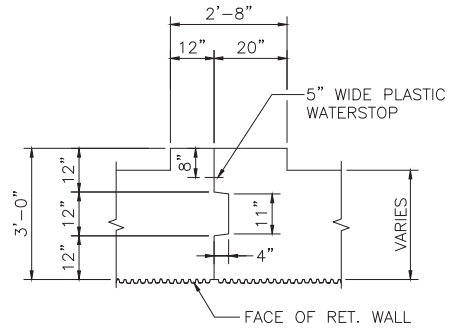
CULVERT RETAINING WALL SECTION
SCALE ⅜" = 1'-0"



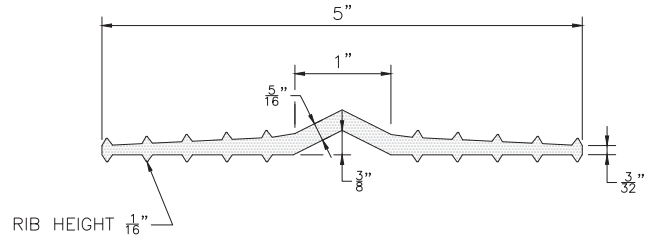
DETAIL AT TOP OF WINGWALL
SCALE: 3" = 1'-0"



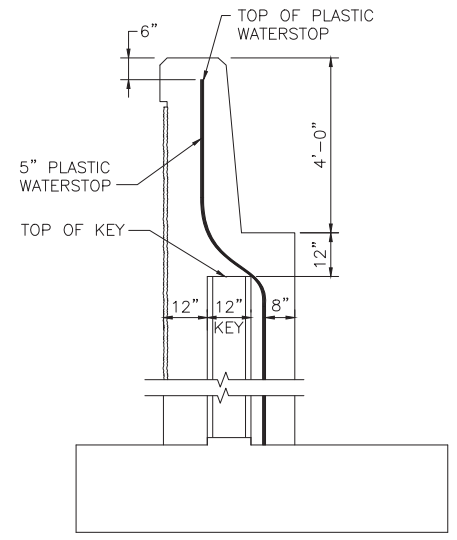
WALL ELEVATION AT CONSTRUCTION JOINT
N.T.S.



SECTION 6
N.T.S.



5" WATERSTOP
N.T.S.



NOTE:
REINFORCEMENT SHALL BE CONTINUOUS THROUGH CONSTRUCTION JOINTS.

VERTICAL SECTION THROUGH CONSTRUCTION JOINT
N.T.S.

RETAINING WALL TYPICAL SECTION

1. 4"ø WEEP HOLES AT 10'-0" MAX. O.C. LOCATED 12" ABOVE THE HEEL OF FOOTING SLOPING 1" PER FOOT TOWARDS FRONT FACE. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
2. RETAINING WALL GEOMETRY AND REINFORCEMENT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO ORDERING MATERIALS OR STARTING WORK.
3. ALL CONCRETE SHALL BE 5000 PSI, 3/4 INCH, 685 HP CAST-IN-PLACE CEMENT CONCRETE. ALL REINFORCEMENT SHALL BE EPOXY COATED

RETAINING WALL DESIGN PARAMETERS

1. BACKFILL AND LOADING CONDITIONS:

   LEVEL BACKFILL
   279 PSF LIVE LOAD SURCHARGE

2. BACKFILL SOIL PROPERTIES

   ø = ANGLE OF INTERNAL FRICTION = 32°
   δ = ANGLE OF WALL FRICTION = 21°
   γ = EFFECTIVE UNIT WIGHT = 130 PCF

3. FOUNDATION SOIL PROPERTIES:

   FACTORED BEARING RESISTANCE = 15.0 KSF
   COEFFICIENT OF FRICTION = 0.62
   RESISTANCE FACTOR FOR SLIDING = 1.0

4. REINFORCED CONCRETE:

   f'c = 5,000 PSI
   Fy = 60,000 PSI

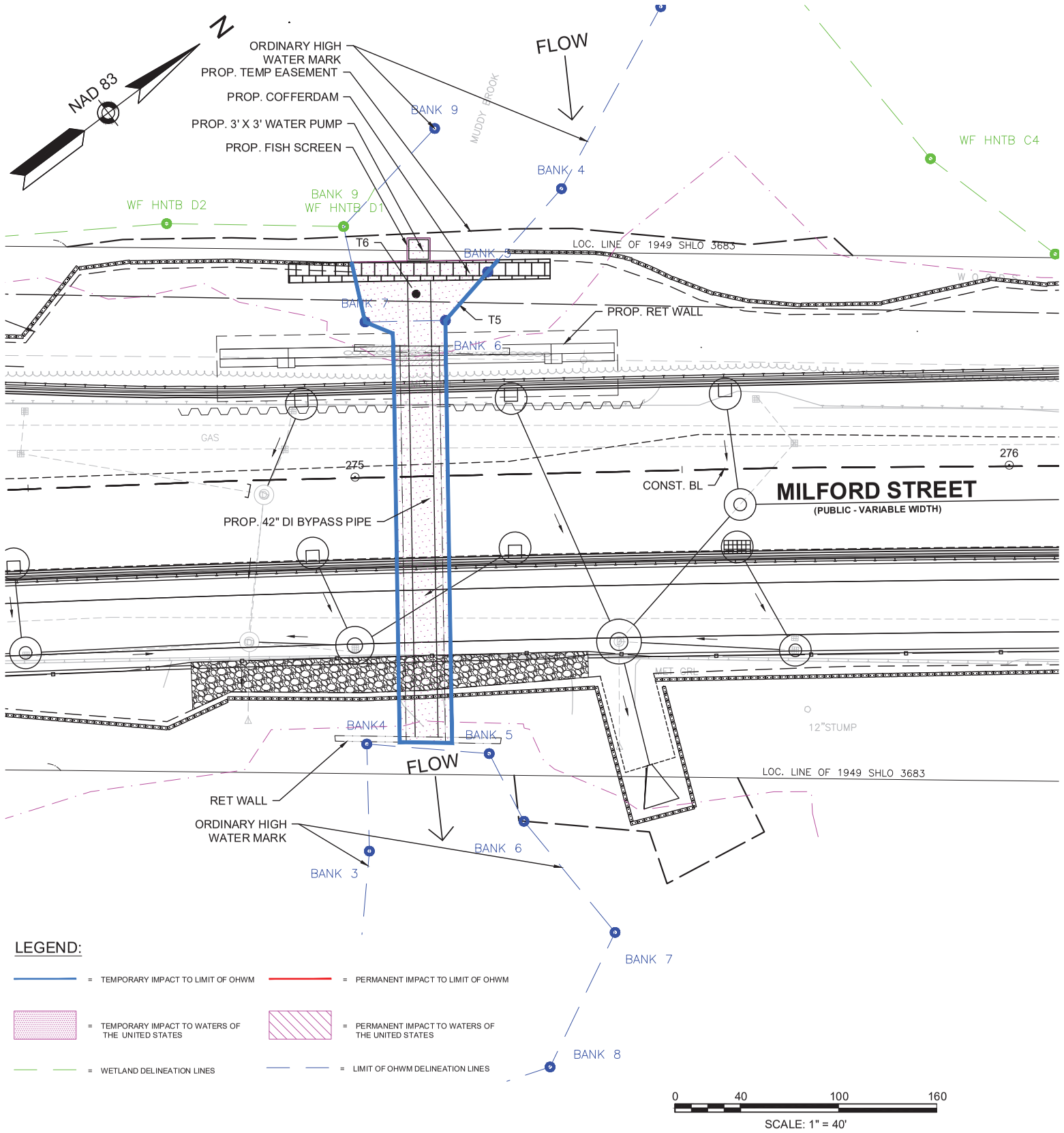
Proposal No. 608491-131468

608491_EV7.21(CULVERT MISC).DWG Plotted on 3-Feb-2025 11:31 PM

A00830 - 343

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	16	38
PROJECT FILE NO.	608491		

CONTROL OF WATER



IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T5	TEMPORARY IMPACTS TO OHWM DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	163 LF
T6	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO CULVERT EXTENSION WORK	HNTB-D / MUDDY BROOK	691 SQ. FT.

GENERAL UPSTREAM CULVERT HEADWALL REPLACEMENT NOTES:

1. THE WORK SHALL OCCUR ON ANY WEEKDAY MONDAY THROUGH FRIDAY. UNDER NO CIRCUMSTANCE WILL A DETOUR BE ESTABLISHED OVER THE WEEKEND WHICH INCLUDES FRIDAY NIGHT, ALL DAY SATURDAY AND SUNDAY.
2. ALL NECESSARY PERMITS FROM THE TOWN OF MENDON AND REGULATORY AGENCIES SHALL BE APPROVED PRIOR TO COMMENCEMENT OF WORK.
3. WATER LEVELS ARE SUBJECT TO CHANGE, THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS/HER OWN DETERMINATION OF WATER LEVELS THAT WILL EXIST DURING CONSTRUCTION.
4. UPON INSTALLATION AND INSPECTED ACCEPTANCE OF ALL SEDIMENT CONTROL MEASURES, THE CONTRACTOR SHALL BEGIN IMPLEMENTING THE STREAM DIVERSION AND DEWATERING PLAN.
5. CONTRACTOR IS RESPONSIBLE FOR INSTALATION OF A FISH PROTECTION SCREEN PRIOR TO THE START OF ANY DEWATERING ACTIVITIES.
6. CONTRACTOR IS RESPONSIBLE FOR CONDUCTING ALL DEWATERING ACTIVITIES DURING TIME OF YEAR (TOY) RESTRICTIONS AS REQUIRED BY MASSDEP.
7. PER OSHA REQUIREMENTS, CONTRACTOR TO PROVIDE A MINIMUM 10 FEET BETWEEN OPERATING EQUIPMENT, PRECAST PANELS ETC. AND OVERHEAD WIRES/UTILITY POLES.
8. INSTALL AN UPSTREAM/DOWNSTREAM COFFERDAM TO DIVERT THE FLOW OF WATER INTO THE BYPASS PIPE TO CREATE A DRY AREA ON THE DOWNSTREAM SIDE OF THE COFFERDAM. CONTRACTOR SHALL USE A WOVEN POLYPROPYLENE BAG COFFERDAM WITH BENTONITE LINING OR APPROVED EQUAL. CONTRACTOR MAY SUPPLEMENT COFFERDAM WITH TEMPORARY PRECAST CONCRETE BARRIER. CONTRACTOR TO USE A SLING TO LIFT BAG AND ONLY USE CLEAN PEA GRAVEL TO FILL BAGS. COFFERDAM HEIGHT SHALL BE 1 FOOT ABOVE THE DESIGN HIGH WATER ELEVATION FOR A TWO YEAR STORM OF 262.61'.

9.1 UPSTREAM WATER NOTES:
2-YEAR ELEVATION HEADWATER: 262.61'

9.2. WATER SURFACE ELEVATIONS AT DOWNSTREAM CULVERT:
100 YEAR FLOOD ELEVATION: 265.5'
10 YEAR FLOOD ELEVATION: 263.58'
WATER ELEVATION: 259.20'

EROSION AND SEDIMENT CONTROL SEQUENCE OF CONSTRUCTION NOTES:

1. PRIOR TO COMMENCEMENT OF LAND DISTURBING ACTIVITIES THE CONTRACTOR SHALL CONDUCT A MEETING ON SITE WITH THE TOWN OF MENDON AND MASSDOT TO DISCUSS THE APPROACH TO EROSION AND SEDIMENT CONTROL AND TO NOTE ANY SPECIAL CONDITIONS OR REQUIREMENTS FOR THE PROJECT.
2. PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITIES, INSTALL ALL PERIMETER EROSION CONTROL DEVICES AND THE CONSTRUCTION ENTRANCE. DISTURBANCE SHALL BE LIMITED TO THE MINIMUM REQUIRED TO INSTALL THE EROSION CONTROL MEASURES.
3. UPON APPROVAL OF INSTALLATION OF EROSION AND SEDIMENT CONTROL PERIMETER DEVICES, COMMENCE WITH SITE CLEARING AND GRUBBING ACTIVITIES.
4. STABILIZE ALL DENUDED AREAS WITHIN 7 DAYS OF DISTURBANCE WITH TEMPORARY OR PERMANENT VEGETATION AND SOIL STABILIZATION BLANKETS.
5. INSTALL UTILITIES AND GRADE IN ACCORDANCE WITH THE PLANS. CONSTRUCT PROPOSED DESIGN ELEMENTS INCLUDING PRECAST CULVERT, SIDE SLOPES AND ROADWAY IN ACCORDANCE WITH THE PLANS.
6. MAINTAIN SERVICE OF ALL EXISTING UTILITIES THROUGHOUT CONSTRUCTION. COORDINATE AND PLAN ANY UTILITY INTERRUPTIONS WITH THE TOWN OF MENDON.
7. MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES THROUGHOUT THE DURATION OF CONSTRUCTION. NO AREA SHALL REMAIN DENUDED MORE THAN 7 DAYS WITHOUT STABILIZATION.
8. INSPECT CONTROLS ON A WEEKLY BASIS AND AFTER EVERY STORM EVENT, ESPECIALLY AT THE PERIMETER. REPAIR ALL DAMAGED DEVICES IMMEDIATELY. COST OF REPAIR OF DAMAGED CONTROLS IS INCIDENTAL TO THE CONTRACT.

GENERAL CONSTRUCTION STAGING NOTES:

1. NO STAGING OR STOCKPILE AREAS SHALL BE ALLOWED IN THE 100 YEAR FLOODPLAIN OR ANY OTHER ENVIRONMENTALLY SENSITIVE AREA. THE 100-YEAR FLOODPLAIN ELEVATION IS ASSUMED TO BE ELEVATION 265.5 ON DOWNSTREAM SIDE AND 267 ON UPSTREAM SIDE. CONTRACTOR SHALL COORDINATE LOCATION AND SIZE OF PROSPECTIVE CONSTRUCTION LAYDOWN AREA PRIOR TO COMMENCEMENT OF WORK AND OBTAIN APPROVAL WITH THE TOWN OF MENDON. ALL WORK STORAGE, OR ANY OTHER STAGING AREAS SHALL BE STABILIZED AS NECESSARY DURING CONSTRUCTION AND UNPAVED TRAFFIC AREAS SHALL BE MATTED OR GRAVELED AND ALL CONSTRUCTION EQUIPMENT USED WITHIN THE STREAM DIVERSION MUST BE PLACED ON MATS.
2. AT THE CONTRACTORS PREFERENCE, AN ALTERNATIVE SEQUENCE OF CONSTRUCTION MAY BE PROPOSED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING THE APPROPRIATE PLANS AND REQUEST IN WRITING FOR A CHANGE TO THESE PLANS AND OBTAIN APPROVAL BY MASSDOT. NO ADDITIONAL COMPENSATION WILL BE ALLOWED FOR DELAYS CAUSED BY THE REVIEW AND APPROVAL PROCESS NOR WILL ADDITIONAL COMPENSATION BE ALLOWED IF ANY PROPOSED CHANGE IS REJECTED. MASSDOT AND OTHER PERMITTING AGENCIES SHALL DETERMINE WHETHER ANY PROPOSED ALTERNATE SEQUENCE IS ACCEPTABLE. IF NO ALTERNATE IS FOUND ACCEPTABLE THEN THE SEQUENCE SHOWN ON THESE PLANS SHALL BE FOLLOWED. CONTRACTOR SHALL SUBMIT PLANS AND CONSTRUCTION SEQUENCE FOR DEWATERING A TWO YEAR STORM AS STATED IN THE MASSDOT BRIDGE MANUAL.
3. ALL LAND WHICH IS DISTURBED BY THE CONTRACTOR, AND WHICH IS NOT BUILT UPON OR SURFACED, SHALL BE ADEQUATELY STABILIZED TO CONTROL EROSION AND SEDIMENTATION IN CONFORMANCE WITH THE CURRENT MASSDOT AND TOWN OF MENDON GUIDELINES.
4. THE DIVERSION IS NOT INTENDED TO BLOCK HIGHWATER EVENTS FROM FLOODING THE DEWATERED AREAS. NO EQUIPMENT OR UNSECURED MATERIALS WILL BE ALLOWED OVERNIGHT WITHIN THE STREAM BANKS IN CASE FLOODING OCCURS.
5. ALL PLACEMENT, ADJUSTMENTS, ETC. OF THE STREAM DIVERSION SHALL BE PERFORMED WHILE OBSERVING ANY IN-STREAM WORK RESTRICTIONS.
6. THE COST OF THE STREAM DIVERSION AND REQUIRED EQUIPMENT (PIPE, RIPRAP OUTLET PADS, PUMPS, SAND BAGS, ETC.) IS TO BE CONSIDERED INCIDENTAL TO ITEM 991.1 CONTROL OF WATER.
7. MATERIAL FOR CONSTRUCTION OF ANY KIND SHALL NOT BE STAGED WITHIN 100 FEET OF A WETLAND RESOURCE AREA THROUGHOUT THE DURATION OF CONSTRUCTION.
8. PRIOR TO COMMENCEMENT OF CULVERT WORK, DOWNSTREAM AREA SHALL BE PROTECTED FROM SCOUR AND POTENTIAL VELOCITY-INDUCED EROSION THROUGH THE INSTALLATION OF A TEMPORARY CONCRETE SCOUR PAD (4'X10'X6").
9. CONTRACTOR TO SUBMIT PLAN FOR DEWATERING WITHIN IN THE COFFERDAM ON THE UPSTREAM SIDE.

Proposal No. 608491-131468
608491_EV10(CONTROL OF WATER).DWG Plotted on 20-Feb-2025 2:46 PM
A00830 - 344

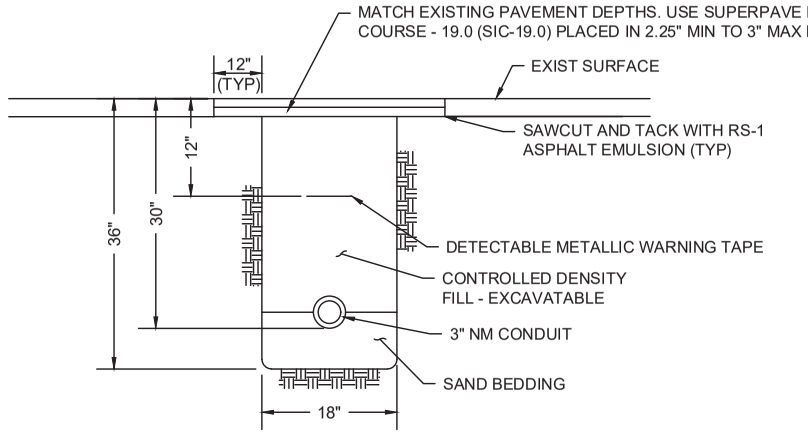
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	20
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 1 OF 4

Plotted on 3-Feb-2025 10:52 PM
608491_EV9(CONST DETAILS).DWG

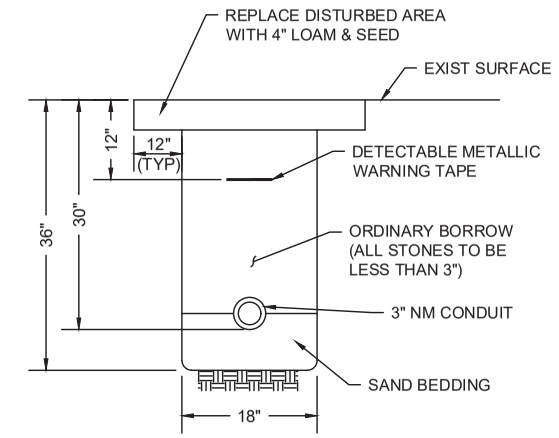
Proposal No. 608491-131468

A00830 - 345



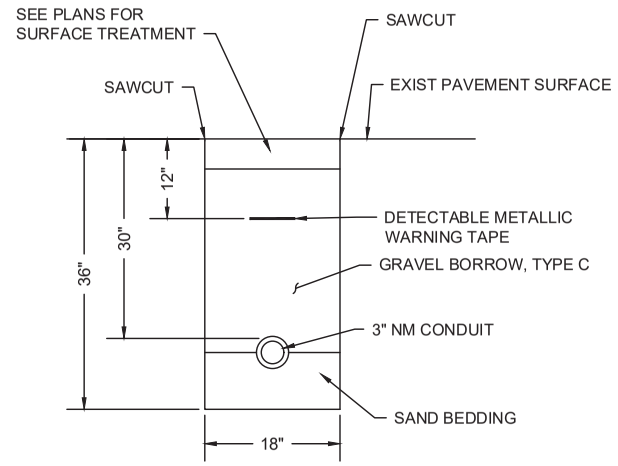
CONDUIT IN CROSSING ROADWAY
NOT TO SCALE

NOTES:
1. TEMPORARY PATCHING WITHIN MILL AND OVERLAY AREAS SHALL BE PAID FOR UNDER ITEM 451.
2. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. CONTROL DENSITY FILL SHALL MEET THE REQUIREMENTS OF MASSDOT MATERIAL SPECIFICATION M4.08.0.
4. WARNING TAPE SHALL BE PER CURRENT AMERICAN PUBLIC WORKS ASSOCIATION STANDARDS.



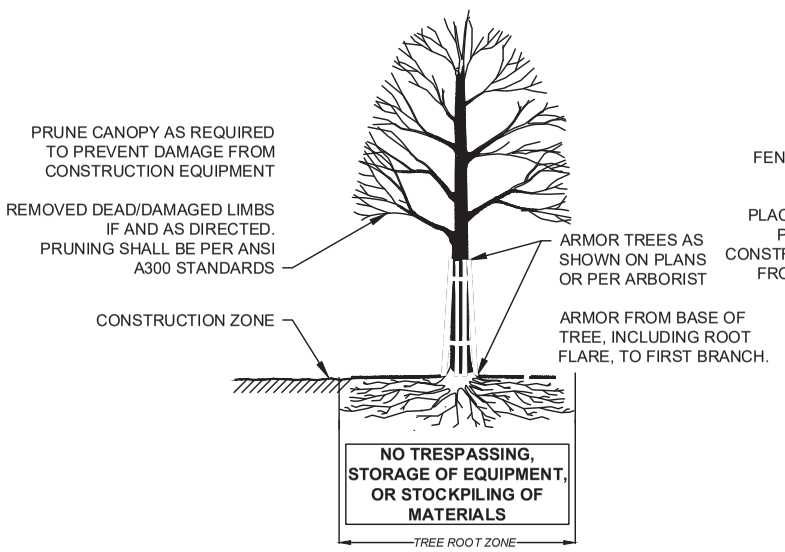
CONDUIT IN GRASS
NOT TO SCALE

NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.



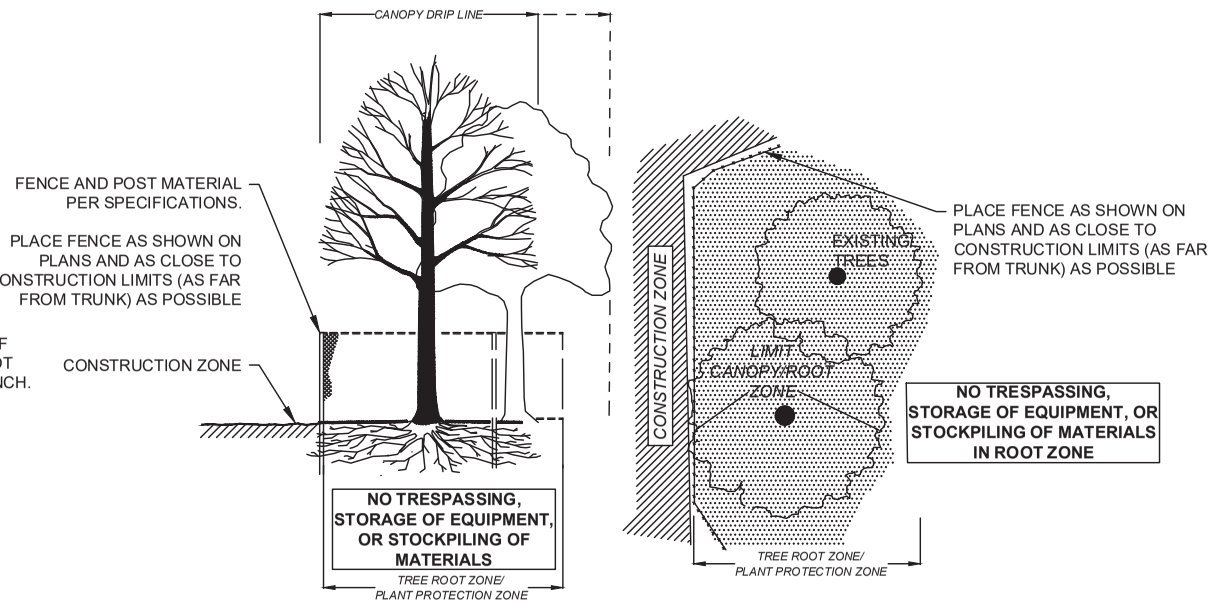
CONDUIT IN SIDEWALK
NOT TO SCALE

NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.



SECTION - TRUNK ARMORING & PRUNING

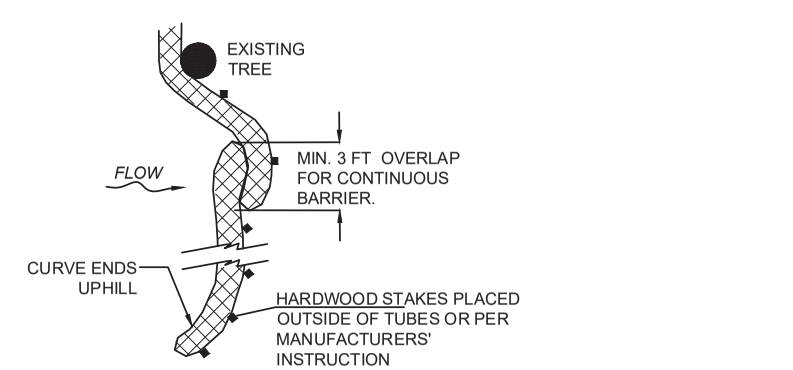
TREE PROTECTION - TRUNK
NOT TO SCALE



SECTION - FENCE PROTECTION OF ROOT ZONE

PLAN VIEW - FENCE PROTECTION OF ROOT ZONE

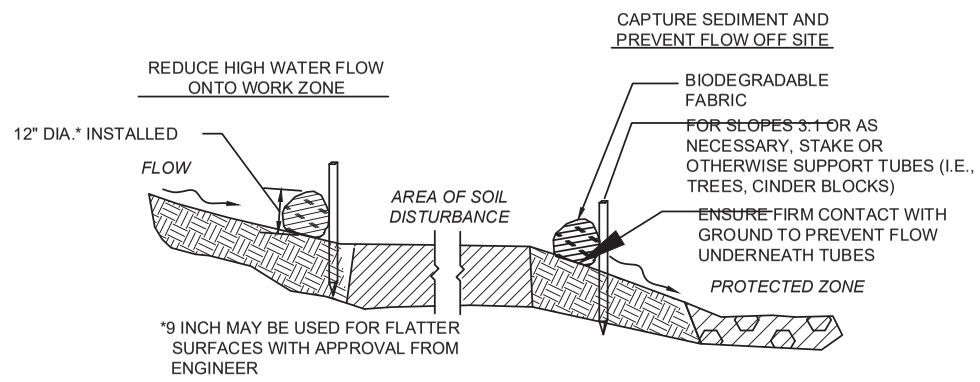
TREE PROTECTION - ROOT ZONE
NOT TO SCALE



PLACE TUBE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE, ALONG CONTOURS, AND PERPENDICULAR TO FLOW.

ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

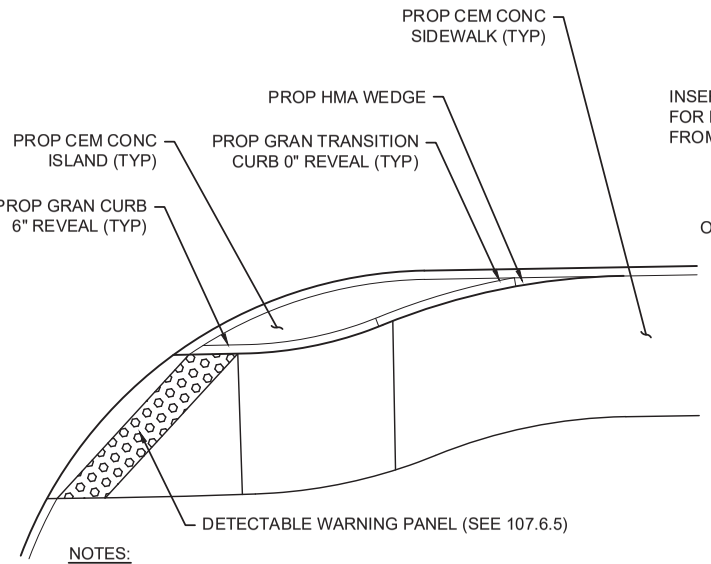
PLAN VIEW



SECTION

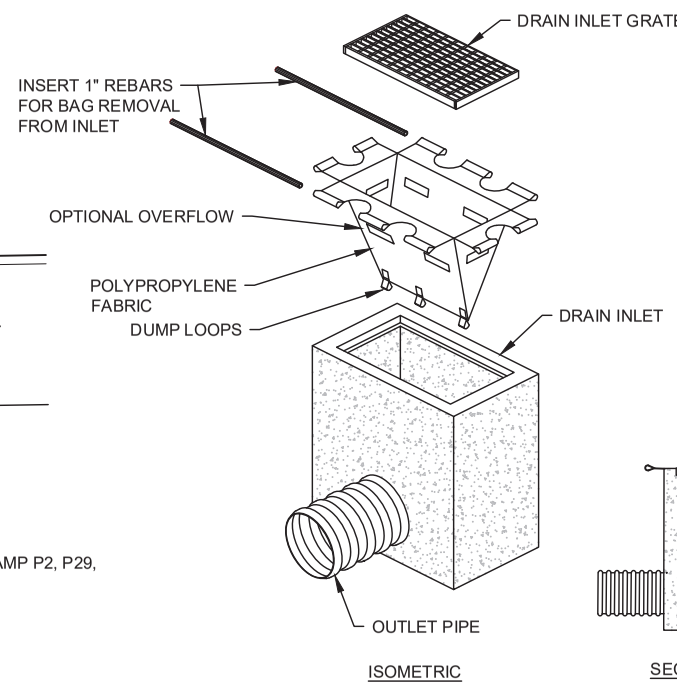
SEDIMENT CONTROL BARRIER
NOT TO SCALE

608491_EVS(CONST DETAILS).DWG Plotted on 3-Feb-2025 10:52 PM



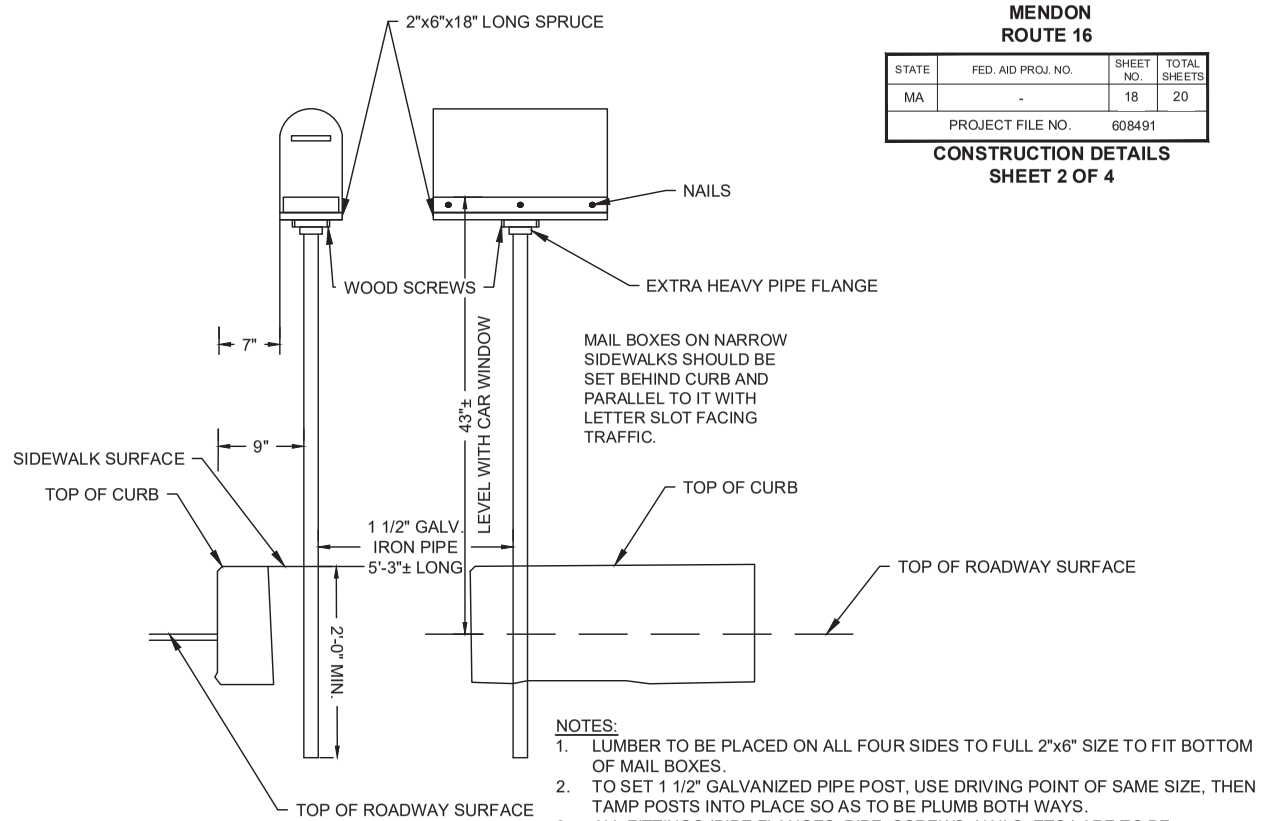
NOTES:
1. SPLAYED END TREATMENT TO BE USED AT PEDESTRIAN CURB RAMP P2, P29, P30 & P32.

SPLAYED END CURB TREATMENT
NOT TO SCALE



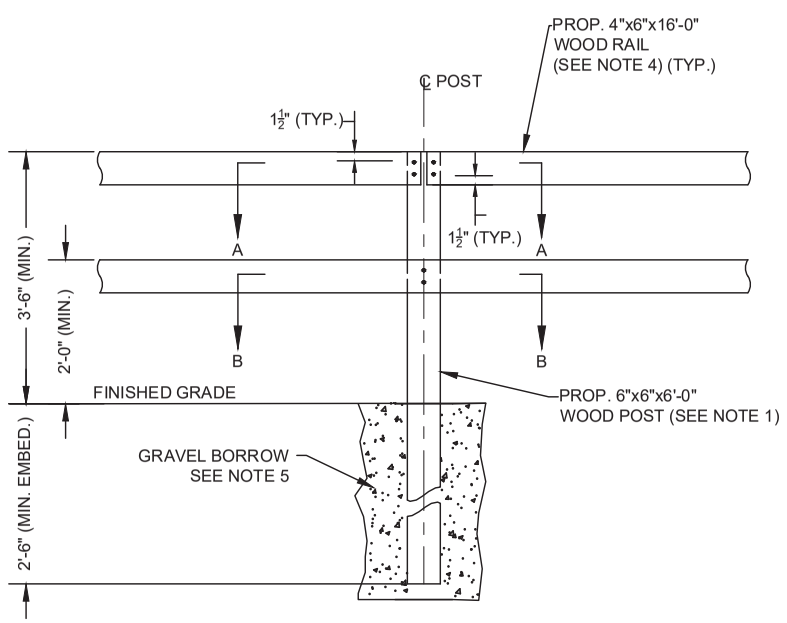
NOTES:
1. INSTALL DRAIN INLET PROTECTION PER MANUFACTURER'S SPECIFICATIONS.
2. REMOVE DRAIN INLET GRATE AND INSTALL POLYPROPYLENE FABRIC OVER DRAIN INLET FRAME. REPLACE DRAIN INLET GRATE TO SECURE POLYPROPYLENE FABRIC IN PLACE.
3. LENGTH AND WIDTH SHALL BE MANUFACTURED TO FIT THE OPENING OF THE DRAIN INLET.
4. MAINTENANCE: REMOVE ALL ACCUMULATED SEDIMENT AND DEBRIS FROM SURFACE AND VICINITY OF UNIT AFTER EACH STORM EVENT. REMOVE SEDIMENT THAT HAS ACCUMULATED WITHIN THE CONTAINMENT AREA OF THE DRAIN INLET PROTECTION SACK AS NEEDED.

TYPICAL DRAIN INLET PROTECTION
NOT TO SCALE

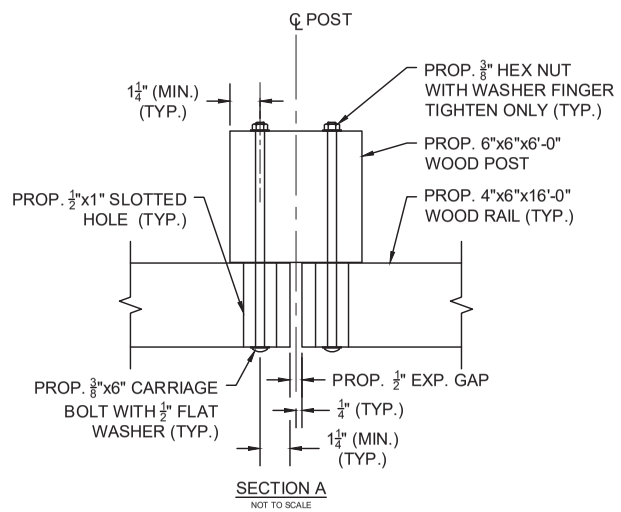


NOTES:
1. LUMBER TO BE PLACED ON ALL FOUR SIDES TO FULL 2"x6" SIZE TO FIT BOTTOM OF MAIL BOXES.
2. TO SET 1 1/2" GALVANIZED PIPE POST, USE DRIVING POINT OF SAME SIZE, THEN TAMP POSTS INTO PLACE SO AS TO BE PLUMB BOTH WAYS.
3. ALL FITTINGS (PIPE FLANGES, PIPE, SCREWS, NAILS, ETC.) ARE TO BE GALVANIZED.
4. FOR DESCRIPTIONS, MATERIALS, AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.
5. A 4"x4" PRESSURE TREATED WOOD POST MAY BE SUBSTITUTED FOR A PIPE POST.

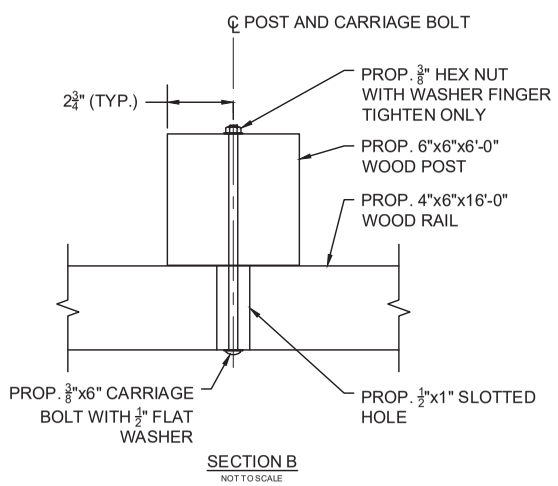
RESIDENTIAL MAILBOX
NOT TO SCALE



WOOD RAILING DETAIL
NOT TO SCALE

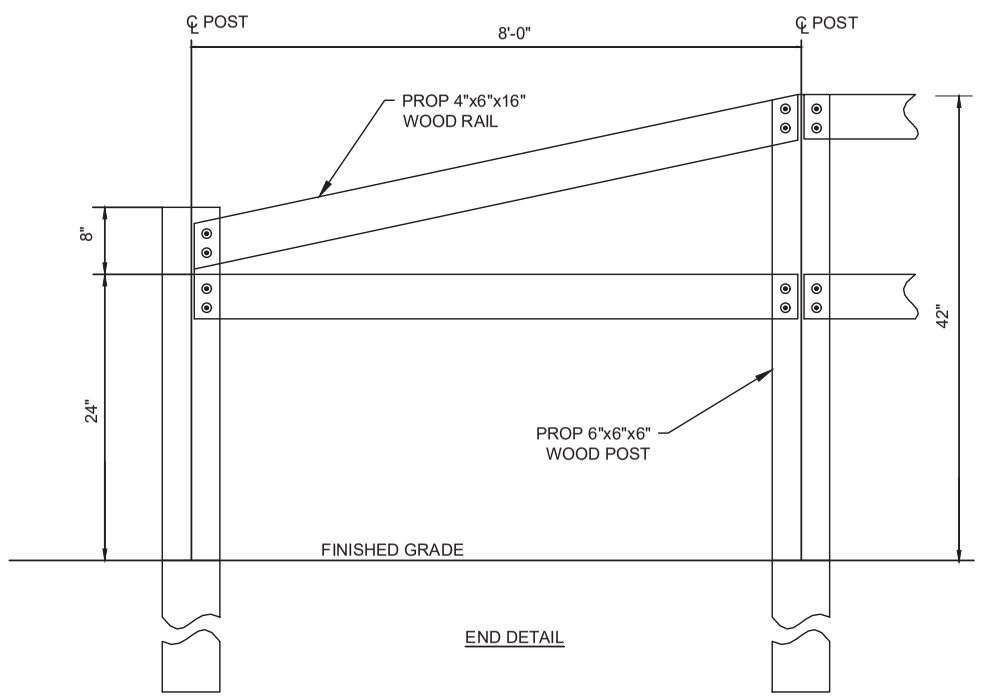


SECTION A
NOT TO SCALE

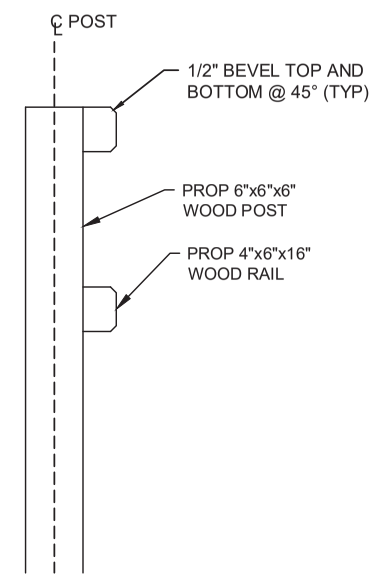


SECTION B
NOT TO SCALE

WOOD RAILING
NOT TO SCALE



END DETAIL



NOTES:
1. POSTS SHALL BE PLACED 8'-0" ON CENTER.
2. THE FACE OF RAIL SHALL BE SET OFF THE EDGE OF BIKE PATH PAVEMENT, AS SHOWN ON THE PLANS, AND AS DIRECTED BY THE ENGINEER.
3. ALL HARDWARE SHALL BE GALVANIZED.
4. ALTERNATE JOINTS IN RAILING BETWEEN POSTS
5. CONTRACTOR SHALL SET POST IN 4,000 PSI, 1-1/2IN, 565 CEMENT CONCRETE FOR ALL POSTS UNABLE TO BE SET AT REQUIRED DEPTH.
6. THESE RAILS SHALL ONLY BE INSTALLED BETWEEN POSTS ADJACENT TO RETAINING WALL LOCATIONS.

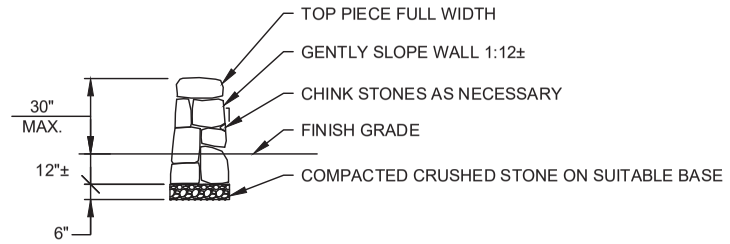
Proposal No. 608491-131468

A00830 - 346

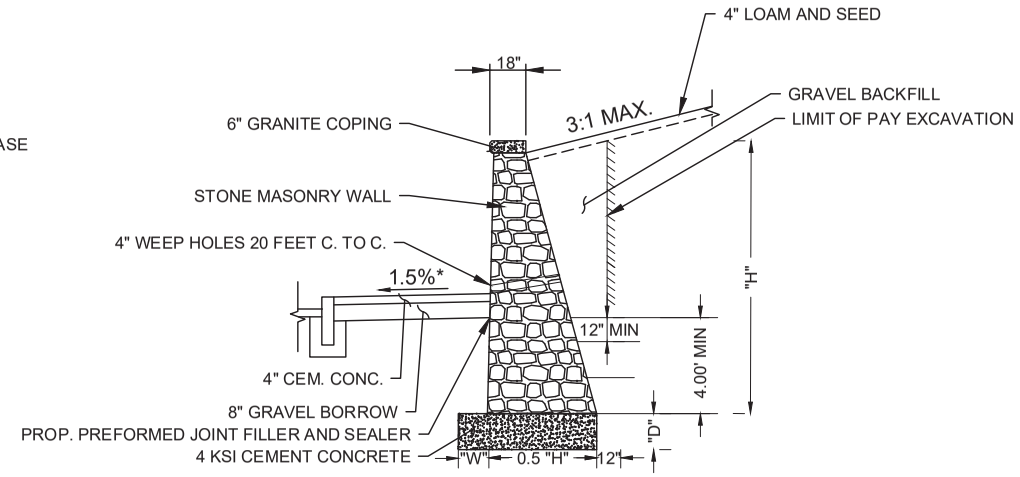
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	20
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 3 OF 4

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608491_EV9(CONST DETAILS).DWG

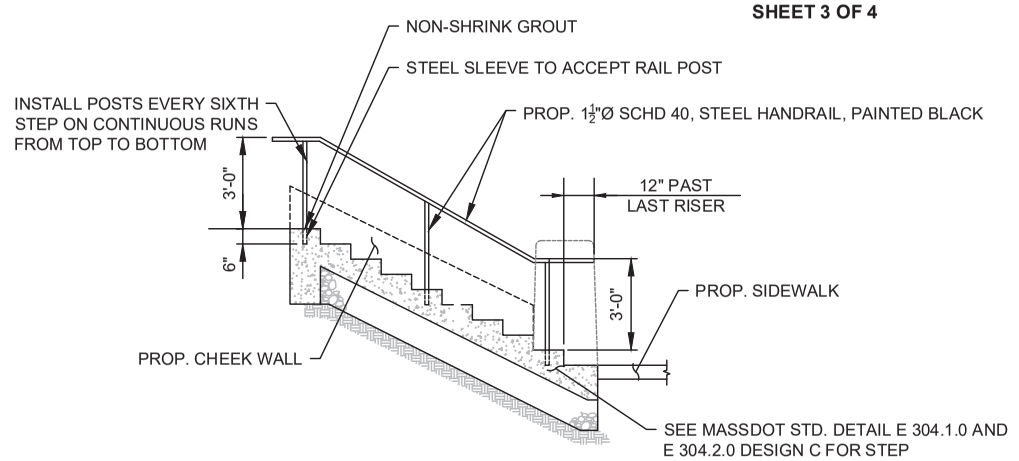


R&R BALANCE STONE WALL
NOT TO SCALE



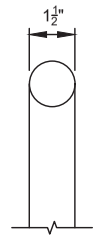
NOTE:
1. SEE MASSDOT STANDARD DETAIL E 302.2.0 FOR FURTHER INFORMATION.
2. H, D AND W ALL VARY DEPENDING ON STANDARD DETAIL E 302.2.0.

WALL TYPE - LOW CEMENTED STONE MASONRY RETAINING WALL
NOT TO SCALE

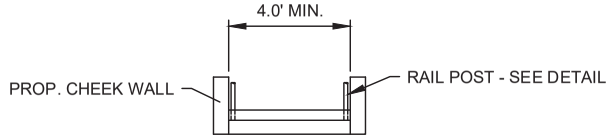


RAILING DETAIL

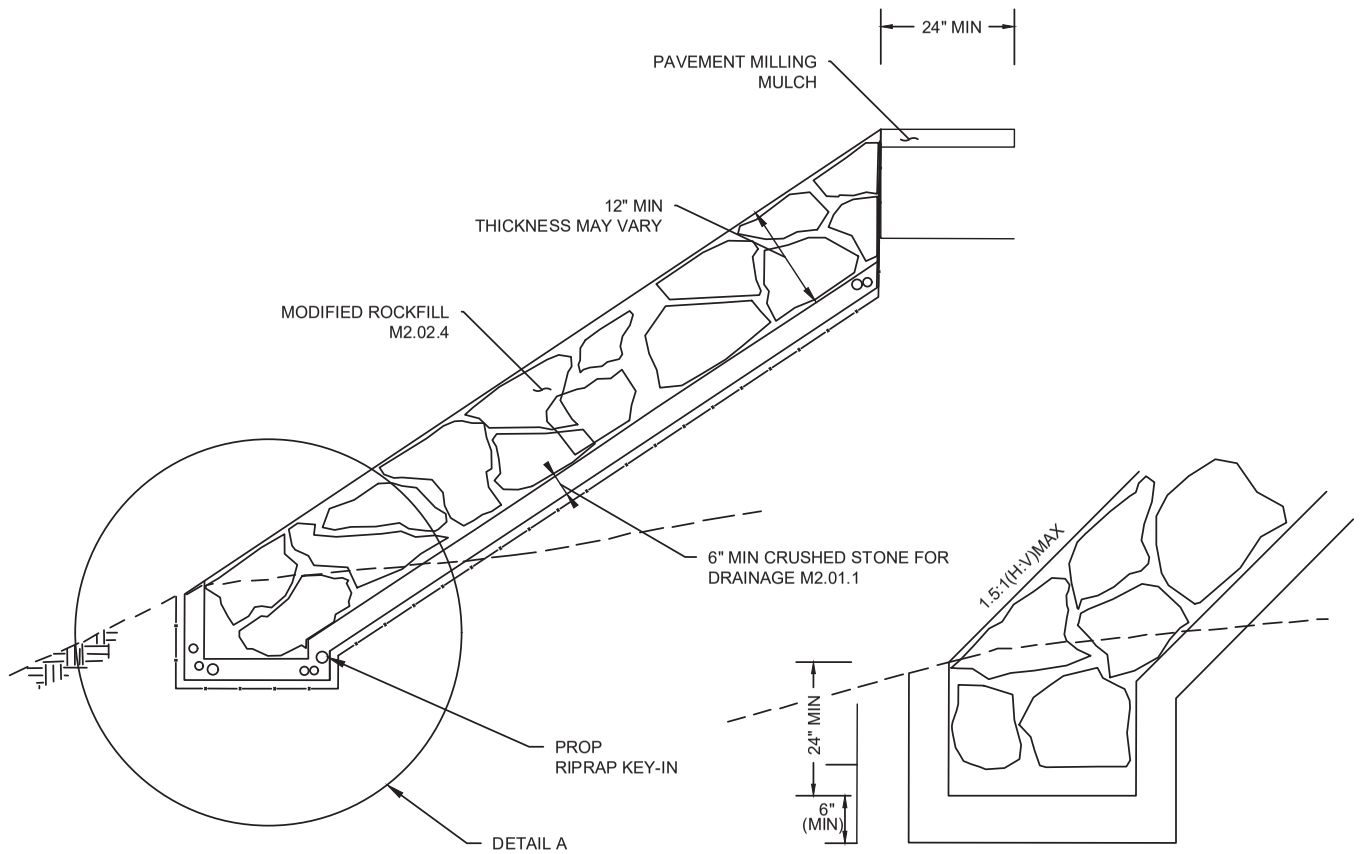
CEMENT CONCRETE STEPS & HANDRAIL DETAIL
NOT TO SCALE



HANDRAIL
NOT TO SCALE

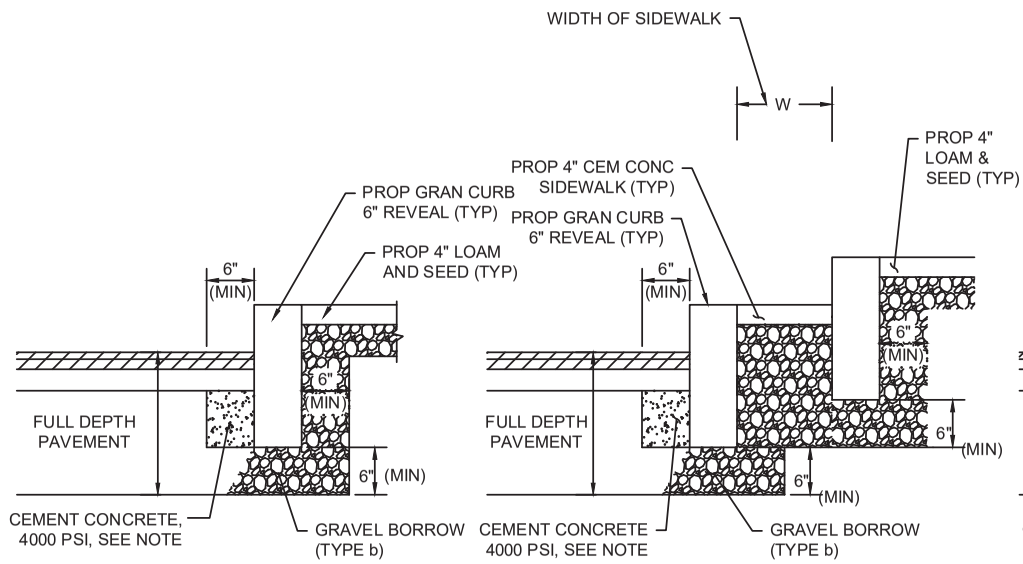


HANDRAIL - SECTION
NOT TO SCALE



KEY-IN DETAIL A

MODIFIED ROCKFILL
NOT TO SCALE

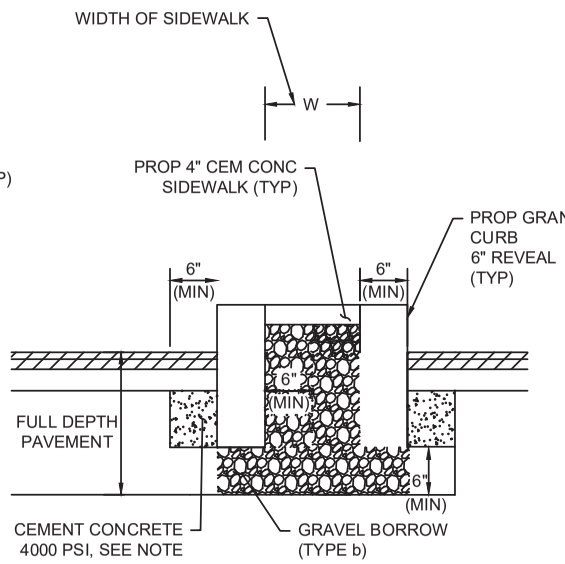


NOTE:
CEMENT CONCRETE SHALL BE PLACED ONLY WHEN CURB IS TO BE SET AFTER BASE COURSE IS PAVED.

GRANITE CURB, TYPE VB,
IN FULL DEPTH PAVEMENT
NOT TO SCALE

NOTE:
CEMENT CONCRETE SHALL BE PLACED ONLY WHEN CURB IS TO BE SET AFTER BASE COURSE IS PAVED.

GRANITE CURB, TYPE VB,
IN FULL DEPTH PAVEMENT &
BACK OF SIDEWALK
NOT TO SCALE



NOTE:
CEMENT CONCRETE SHALL BE PLACED ONLY WHEN CURB IS TO BE SET AFTER BASE COURSE IS PAVED.

GRANITE CURB, TYPE VB,
IN FULL DEPTH PAVEMENT &
BACK OF SIDEWALK WITH
PARKING LOT
NOT TO SCALE

Proposal No. 608491-131468
A00830 - 347

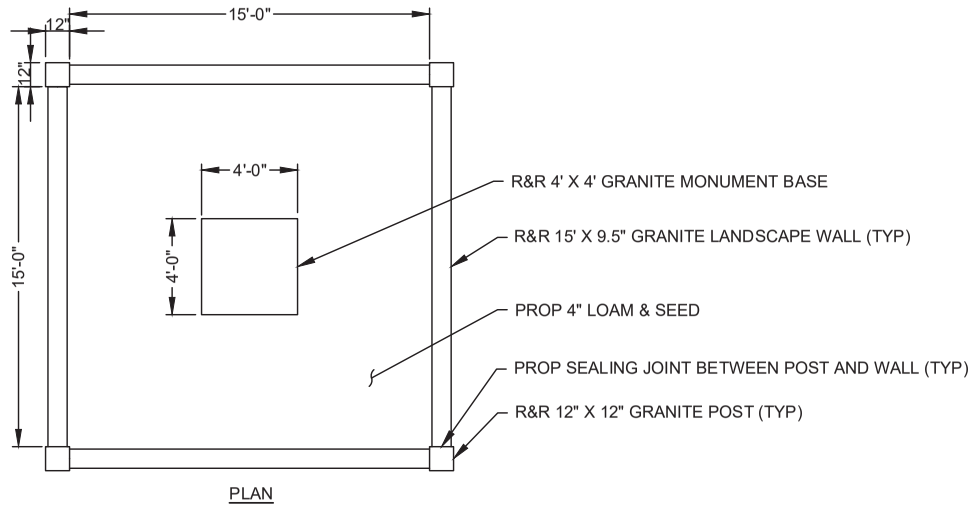
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	20	20
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 4 OF 4

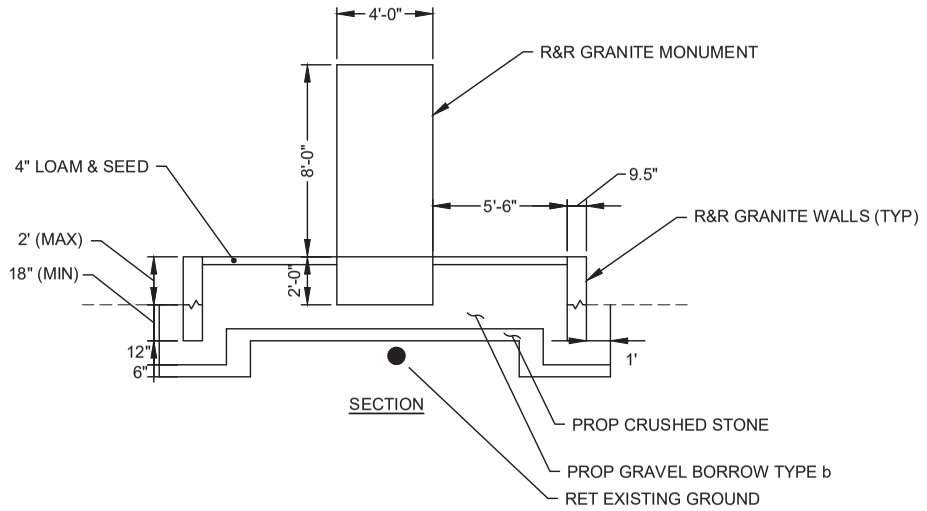
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Proposal No. 608491-131468

A00830 - 348



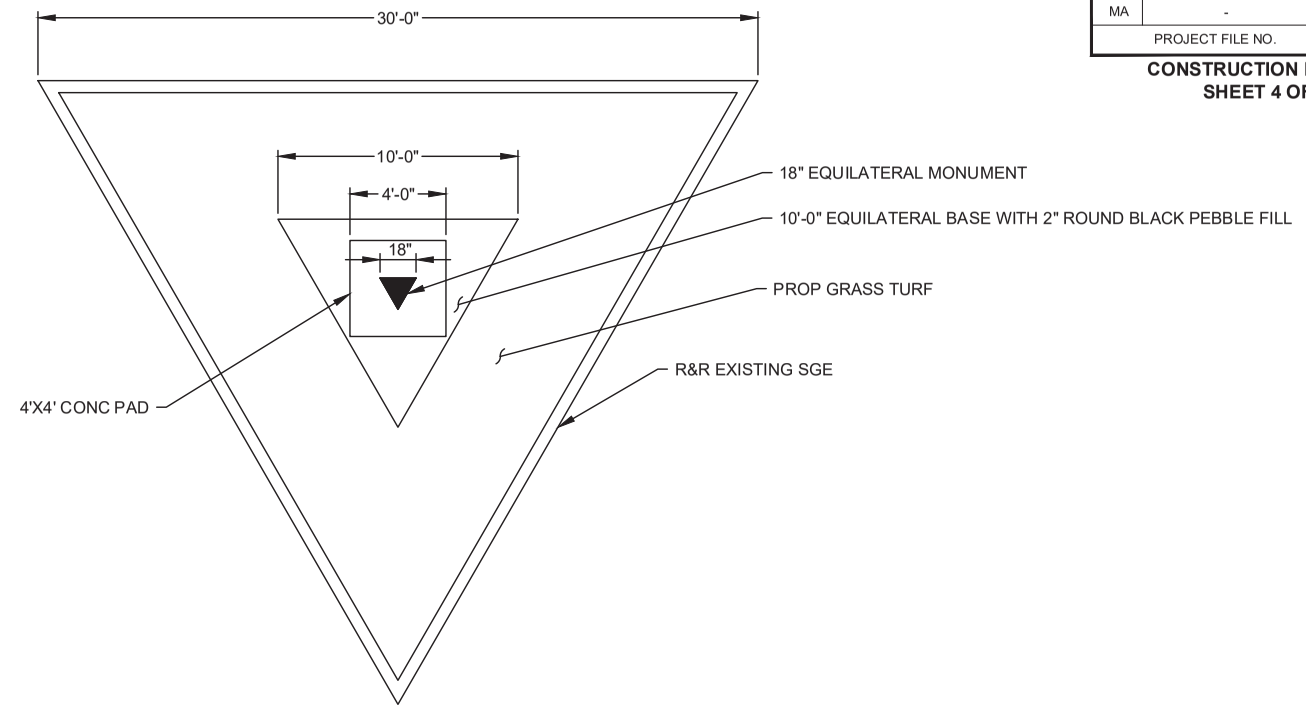
PLAN



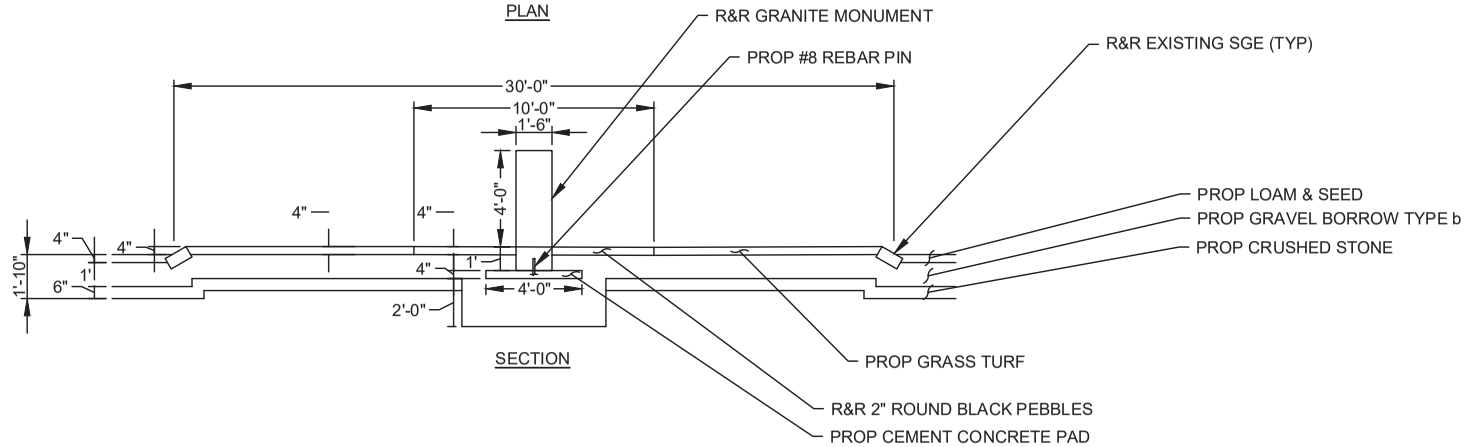
MONUMENT #1
NOT TO SCALE

MONUMENT #1 NOTES:

1. DIMENSIONS FOR MONUMENTS ARE APPROXIMATE AND CONTRACTOR TO RELOCATE MONUMENTS IN KIND.
2. MONUMENT "A" IS TO HAVE ALL WALLS AND POSTS REMOVED AND RESET TO THE NEW LOCATION.
3. COLORED JOINT SEALANT TO BE USED WHERE GRANITE POST AND WALLS JOIN TOGETHER.
4. CONTRACTOR TO PROVIDE ORDINARY BORROW, GRAVEL BORROW, CRUSHED STONE & LOAM AND SEED WHERE NECESSARY FOR BOTH MONUMENTS.
5. CONTRACTOR TO SET THE GRANITE POSTS AND WALLS USING ITEM 901. (4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE).
6. MONUMENT "A" TO BE SET BY CONTRACTOR PRIOR TO POURING OF CONCRETE SURROUNDING PLAZA.



PLAN



MONUMENT #2
NOT TO SCALE

MONUMENT #2 NOTES:

1. DIMENSIONS FOR MONUMENTS ARE APPROXIMATE AND CONTRACTOR TO RELOCATE MONUMENTS IN KIND.
2. EXISTING SLOPED GRANITE EDGING AND LANDSCAPE LIGHTING AT MONUMENT "B" TO BE REMOVED AND RESET AT NEW LOCATION. LIGHTING IS SOLAR POWERED AND NO HARDWIRING IS INCLUDED.
3. MONUMENT "B" TO HAVE NEW OUTDOOR ARTIFICIAL TURF AND BLACK 2" ROUND PEBBLES INSTALLED TO BE REUSED FROM EXISTING MONUMENT.
4. COLORED JOINT SEALANT TO BE USED WHERE GRANITE POST AND WALLS JOIN TOGETHER.
5. CONTRACTOR TO PROVIDE ORDINARY BORROW, GRAVEL BORROW, CRUSHED STONE & LOAM AND SEED WHERE NECESSARY FOR BOTH MONUMENTS.
6. CONTRACTOR TO FORM A NEW CONCRETE PAD (4'X4' & 4" DEPTH) FOR MONUMENT "B" BY USING ITEM 901. (4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE).
7. A #8 BAR TO BE SET IN THE CONCRETE PAD SO THAT THE MONUMENT STRUCTURE CAN REST IN PLACE. NO ADHESIVE IS REQUIRED TO ADHERE THE MONUMENT WITH THE CONCRETE PAD.

Attachment D

Representative Photo Log of Proposed Culvert and Headwall Alterations

Muddy Brook



Photo 1: View of channel and culvert north of Route 16, facing downstream. Project work is proposed for the channel culvert north of Route 16. Photo taken September 27, 2023.

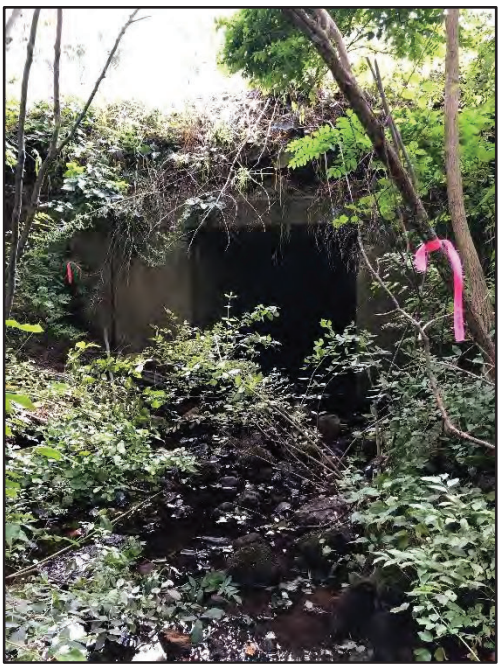


Photo 2: View of channel and culvert north of Route 16, facing downstream. Photo taken August 7, 2020.

Unnamed Intermittent Stream (ST 224+40)



Photo 3: View of channel and culvert of unnamed intermittent stream north of Route 16.
Photo taken September 27, 2023.

Attachment E

Revised Project Narrative

HNTB

1. Introduction

In accordance with Section 404 of the Clean Water Act (CWA), the Massachusetts Department of Transportation – Highway Division (MassDOT) is submitting this application for a U.S. Army Corps of Engineers (USACE) Pre-Construction Notification (PCN) under Massachusetts General Permit (GP) #23 – Linear Transportation Projects and Wetland/Stream Crossings. MassDOT is requesting authorization to perform work in jurisdictional Waters of the United States (WOTUS) along Route 16 (Uxbridge Road) in Mendon, Massachusetts. The purpose of the project is to improve safety, operations, and connectivity for all users, consistent with MassDOT's Healthy Transportation Directive (P-13-0001).

The project corridor consists of 2.02 miles of Route 16 between Taft Avenue and the Hopedale Town Line, as shown on the United States Geological Survey (USGS) Topographic Map (Figure 1) in Appendix A. The following intersections and their roadway approaches constitute the project corridor:

- Route 16 and Hartford Avenue West
- Route 16 and Millville Street
- Route 16 and Emerson Street / Washington Street
- Route 16 and Maple Street
- Route 16 and Main Street / North Avenue

Work will include pavement repair and resurfacing, provision of bicycle and pedestrian accommodations, including a shared-use path, reconstruction of the signalized intersections to include new traffic signal equipment, and address issues from previous road safety audits. Additionally, the project includes drainage improvements along the corridor, vegetation clearing to improve sight distances, and work on two existing culverts to accommodate the widening necessary for the shared-use path.

The project will result in 73 square feet (sf) of permanent and 842 sf of temporary impacts to WOTUS, and 275 linear feet (lf) of temporary impacts and 41 lf of permanent impacts to the limit of Ordinary High Water Mark (OHWM) associated with the Muddy Brook River and an unnamed intermittent stream. During construction, erosion and sedimentation controls such as silt fencing and compost filter tubes (or similar) will be utilized. All erosion and sedimentation controls will be removed following completion of the work, and all disturbed areas will be permanently stabilized. Sections 4 and 5, respectively, include a detailed discussion of the project impacts and mitigation.

In addition to filing this PCN, the project will require the following permits and regulatory approvals: an Order of Conditions from the Mendon Conservation Commission; Massachusetts Endangered Species Act (MESA) Review; National Environmental Policy Act (NEPA) Compliance; Section 7 of the U.S. Endangered Species Act consultation; and Section 106 of the National Historic Preservation Act consultation.

2. Existing Conditions

The project begins at Route 16 in Mendon just west of Taft Avenue and continues east for 2.02 miles on Route 16 to the Hopedale Town Line before terminating just east of Harrington Street (Figure 2). The

following subsections detail the existing project corridor conditions, the results of a desktop review, and the results of a field delineation.

2.1 Existing Roadway Conditions

Route 16, also known within Mendon as Uxbridge Road or Milford Street, is an east-west state highway in Massachusetts, spanning Worcester, Middlesex, Norfolk, and Suffolk Counties. Within the Site, Route 16 generally runs east-west with one lane in each direction. Parking is prohibited on both sides of the roadway along the Site. The section of Route 16 in Mendon within the Site has a posted speed limit of 45 miles per hour (mph) from the Uxbridge Town line to Maple Street and drops to 35 mph between Maple Street and North Avenue/Main Street. The posted speed limit east of North Avenue to Granite Street is 50 mph. The speed limit between Granite Street and the Hopedale town line is 40 mph.

Currently, there is no bicycle accommodation on Route 16. Route 16 also has several substandard design features, including insufficient stopping sight and decision sight distance, instability in the asphalt pavement, and current geometrics of the roadway, which have led to excessive vehicle speeds. There is a mix of commercial, residential, industrial, and recreational properties directly abutting the project corridor.

2.2 Existing Drainage Conditions

There are eight existing drainage areas that discharge to existing outfalls located at low points along the Route 16 project corridor. Stormwater run-off is captured by a series of catch basins along the gutter line of the road and conveyed through a network of closed pipes.

The Muddy Brook Culvert is an existing 6' x 6' concrete box culvert that conveys Muddy Brook under Route 16. The culvert length is 61 feet, with an upstream invert of 259.89 and a downstream invert of 259.20. The slope of the culvert is 1.13%. A site visit was conducted by HNTB on August 10, 2020, in which the culvert was photographed. The culvert barrel appeared to be in good condition. Minor spalling, cracking, and chipping were observed on the upstream headwall. The downstream headwall appeared to be in good condition. The Rt. 16 culvert over an unnamed stream (STA. 224-225) is a 30" reinforced concrete pipe (RCP).

2.3 Existing Environmental Conditions

2.3.1 Desktop Assessment

According to the United States Geological Survey (USGS) topographic map, the approximate range of elevation for the Site is from 273 to 445 feet above mean sea level (Figure 1). Most of the area impacted by the Project consists of the previously cleared and maintained Route 16 right-of-way. The remaining portions of the Project are a mixed use of residential, commercial, and industrial properties.

Based on reviews of the MassDEP Wetland Area Maps for Worcester County[1], the Site is mapped as having the following inland resources: Shallow Marsh Meadow or Fen, Wooded Swamp Deciduous, and Wooded Swamp Mixed Trees (Figure 3).

[1] MassDEP. 2020. Mass DEP Online Map Viewer Wetland and Wetland Change Areas Map. Available at: http://maps.massgis.state.ma.us/images/dep/omv/wetviewer.htm. Accessed November 2022.

Based on a review of the National Wetland Inventory (NWI) Map provided by the U.S. Fish and Wildlife Service (USFWS), inland wetlands are mapped within and surrounding the Site and have similar boundaries as the inland resources mapped by MassDEP (Figure 4). The wetlands mapped within the Site are classified as palustrine forested, broad-leaved deciduous, seasonally flooded/saturated (PFO1E), palustrine emergent, persistent, seasonally flooded/saturated (PEM1E), riverine, intermittent, streambed, seasonally flooded (R4SBC), and riverine, perennial, unconsolidated bottom, permanently flooded (R5UBH).

The most recently issued Flood Insurance Rate Map[2] produced by the Federal Emergency Management Agency (FEMA), indicates that portions of the Site in the vicinity of Muddy Brook are mapped as Zone AE, which is characterized as having a 1% annual chance of a flood hazard (also known as the 100-year floodplain) and Regulatory Floodway, which is classified as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height (Figure 5). The base flood elevation upstream of the culvert under Route 16 is 267.0 feet above mean sea level, and the base flood elevation downstream of the culvert under Route 16 is 265.5 feet above mean sea level. According to USGS StreamStats data, the bankfull width of Muddy Brook River is approximately 17.8 feet, and the approximate bankfull width of the unnamed stream is 3.4 feet.

The U.S. Department of Agriculture Natural Resources Conservation Service[3] (USDA – NRCS) soil survey for Worcester County has mapped most of the Project as Scituate fine sandy loam, 3 to 8 percent slopes (315B). For a full listing of the hydric soils within and surrounding the Site, refer to Figure 6.

According to the most recently available data provided by the Massachusetts Natural Heritage and Endangered Species Program[4], a small portion of the Project falls within an Estimated Habitat of Rare Wildlife area (EH 673) and Priority Habitat of Rare Species area (PH 858) (**Figure 7**). There are no Certified or Potential Vernal Pools within or adjacent to the Site. The closest Certified Vernal Pool (CVP 8232) is located approximately 1,800 feet west, and the closest Potential Vernal Pool (PVP 14011) is located approximately 200 feet west. Muddy Brook is a designated coldwater fishery (SARIS ID #5131300).

The Project is not located within an Area of Critical Environmental Concern[5] or Outstanding Resource Water[6]. The Project is located within several Zone I, Zone II, or Interim Wellhead Protection Areas[7].

Three open space parcels directly abut the project corridor (Figure 8). The Mendon Driving Range, which is privately owned, is located approximately 850 feet south of the Route 16/Washington Street intersection. Founders' Park, owned by the Town of Mendon, is located directly adjacent to the Route 16/North Avenue intersection. Muddy Brook North Conservation Area, also owned by the Town of Mendon, runs parallel along Route 16 from just north of the Route 16/North Avenue intersection to the Mendon Twin Drive-In Theater.

[2] Federal Emergency Management Agency, October 2017, National Hazard Flood Layer, Digital Flood Insurance Rate Map. Map 25027C1031E. Effective 7/4/2011. Accessed November 1, 2022.
[3] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey
[4] Massachusetts Natural Heritage and Endangered Species Program, Oct. 2017. Massachusetts Natural Heritage Atlas. 14th Edition.
[5] MassGIS (collaboration with DCR and CZM), Sept. 2017. Massachusetts ACECs.
[6] MassGIS, Dec. 2017. Designated Outstanding Resource Waters of Massachusetts.
[7] MassGIS, Oct. 2017. Approved Wellhead Protection Areas (Zone I and IWPAs).

2.3.2 Field Delineation of Wetlands and Waters of the United States

A field delineation was conducted on August 7th in accordance with methods developed by USACE[8,9]. A second field verification was performed on October 4th, as the original delineation is greater than three (3) years old. The affidavit signed by an HNTB wetland scientist detailing the changes to the original resource lines is included in Appendix B. Wetland resources identified within or near the project corridor include Vegetated Wetlands (VW), Perennial Stream, Intermittent Stream, Bank, and Floodplain.

Wetland resource areas within the project corridor are summarized in the table below and depicted on the Site Plans in Appendix C. Refer to the Wetland Delineation Report and Wetland Delineation Affidavit in Appendix B for details on each delineated wetland area, including written descriptions, photographs, and field data forms.

Table 1. Summary of Waters and Wetlands within Project Corridor

Wetland Series	USACE Regulated Features				
	Vegetated Wetland	Perennial Stream	Intermittent Stream	Bank	Floodplain
HNTB-A	X				
HNTB-B	X				
HNTB-C	X				
HNTB-D	X				
HNTB-E	X				
HNTB-F	X				
HNTB-G	X				
HNTB-H	X				
HNTB-I	X				
HNTB-J	X				
Muddy Brook		X		X	X
Willow Brook			X	X	
Unnamed Intermittent Stream			X	X	

3. Proposed Conditions

3.1 Proposed Project

The project proposes an 11-foot travel lane in each direction with a 2-foot shoulder in the eastbound direction and a 5-foot shoulder in the westbound direction. From Hartford Avenue West until the Washington Street/Emerson Street intersection, a two-way left turn lane is proposed. The design will also include an 8-foot shared-use path with a 4-foot grass buffer in the eastbound direction for the length of the Project and a 7-foot sidewalk in the westbound direction from Hartford Avenue West to North Avenue. Most of the Project will consist of a standard mill and overlay with sections of full depth widening in areas where the cross-section is increasing in width.

Both the sidewalk and the shared-use path will be hot-mix asphalt (HMA) pavement. To improve safety

[8] USACE, 1987. Corps of Engineers Wetlands Delineation Manual
[9] USACE, 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0.

and traffic operations, five (5) intersections along the corridor will be reconstructed with geometric improvements (Hartford Avenue West, Millville Street, Emerson Street/Washington Street, Maple Street, and Main Street/North Avenue). Traffic signal improvements are proposed at Hartford Avenue West, Maple Street, and North Avenue/Main Street, and Americans with Disability Act of 1990 (ADA) compliant crossings will be constructed at all roadway crossings where pedestrian facilities are present.

3.1.1 Roadway Resurfacing and Reconstruction

The project proposes the construction of an 8-foot shared-use path along Route 16 within the project corridor, which will require full depth widening. The project also proposes standard mill and overlay along Route 16 and the associated intersections to improve substandard pavement conditions. The mill and overlay portion of the project involves grinding off the top layer of existing asphalt pavement using a large milling machine and replacing this layer with a new HMA riding surface. The typical milling depth is between 1" and 2", depending on the condition of the existing riding surface, the depth of the available curb reveal, and the depth of the existing asphalt pavement.

3.1.2 Drainage Improvements

The project proposes several improvements to the existing drainage system, including deep sump catch basins, a sediment forebay for pre-treatment with an open-graded infiltration basin, and grassed channels with sediment forebays and check dams for collection and treatment of runoff. All runoff will flow into deep sump catch basins or vegetated conveyance channels, which is an improvement to the existing conditions where only standard catch basins currently exist.

Existing pipes and structures were maintained to the maximum extent possible. The physical constraints of the existing drainage system limited the flexibility of the proposed design. Proposed pipes were placed at the lowest elevation possible to maximize cover, meet all corresponding existing downstream inverts, and adhere to the MassDOT standards.

3.1.3 Culvert Work at Muddy Brook

The project proposes an 8-foot shared-use path and a 4-foot grass buffer strip along the roadway above Muddy Brook. No changes are proposed to the existing culvert's size, capacity, or slope, so the work is not anticipated to have any significant changes to the flow regime on either the upstream or downstream side. No work is being proposed on the downstream side, and work on the upstream side is limited to the removal of the existing headwall and installation of concrete retaining walls on either side of the culvert's inlet in its place. The bank and receiving areas are generally stabilized, and no evidence of erosion in the current condition was observed during the site investigation.

It is anticipated that removal of the existing headwall and installation of the concrete retaining walls will require dewatering. The Contractor will be responsible for determining the extent of dewatering required and proposing the most appropriate methods and materials. Prior to working in the stream bed, the Contractor will submit plans to MassDOT for approval. These plans shall depict the proposed materials and methods of controlling flow and water within the work area. This includes cofferdams, flow diversion, and dewatering systems. These plans shall be in conformance with the contract plans and specifications. All dewatering and/or pump-around related earthwork will be conducted in such a manner as to prevent potential siltation and contamination of the waterways. Water from the work area will be pumped into a sediment filter bag, which will be placed in an upland area and encircled with compost filter tubes or straw wattles. All filtered sediments will be removed from the project corridor and disposed of off-site.

3.1.4 Culvert Extension at Unnamed Stream

The project proposes an 8-foot shared-use path and a 4-foot grass buffer strip at the unnamed stream adjacent to HNTB-G. These roadway improvements will result in a wider roadway cross section, which will require the existing culvert to be extended by approximately 15-feet on the downstream end. Included in the culvert extension will be a new concrete headwall at the downstream end. No changes are proposed to the culvert size, capacity, or slope, and it is not anticipated to have any significant changes to the flow regime. The Contractor will be responsible for determining the extent of dewatering required and proposing the most appropriate methods and materials. Prior to working in the stream bed, the Contractor will submit plans to MassDOT for approval.

3.2 Anticipated Construction Sequence

The first stage of construction (Phase 1 – Construction Startup) involves the relocation of existing utility poles and overhead wires, tree trimming, and tree removal to enable work and the establishment of erosion and sedimentation controls. Tree trimming and removal will be required along the right-of-way to maintain roadway safety, the visibility of road signs, and sight distances and to enable proposed work.

Phase 2 (Median – One Lane Northbound & One Lane Southbound) involves the installation of traffic controls and detours, roadway excavation within the median, full depth concrete paving, granite curbing, and the installation of new guardrail.

Phases 3 and 4 (Southbound and Northbound Sides, respectively) includes the installation of traffic controls and detours, roadway excavation, full depth concrete paving, granite curbing, loaming, and seeding, micro milling, and the installation of new guardrail. Work on both culverts will occur during Phase 3. Temporary widening of the roadway will be utilized to allow for construction access for construction activities.

The following are assumptions used throughout construction to prepare the staging plans and the construction contract time determination schedule:

- The schedule has been determined based on the contractor having 1,000 feet of work zone setup at any given time. It is assumed the contractor will have two (2) crews working on the linear portion of the corridor.
- It is assumed there will be no night work.
- Bicycle and pedestrian accommodation will be maintained for the duration of construction. In areas of the Route 16 corridor where the contractor cannot provide a dedicated bicycle facility bicycle lane or minimum 4-foot shoulder, a shared travel lane with the appropriate signage will be provided.

Please note that the contractor will determine the exact sequence of construction. Additionally, the location of laydown areas and stockpiles within the roadway right of way will be determined by the contractor. Laydown areas and stockpiles will not be located within a wetland resource.

4. Wetland Impacts

The project will result in temporary and permanent impacts to the limit of OHWM and WOTUS. Impacts to sensitive environmental resource areas are quantified in the table below.

Table 2. Summary of Impacts

USACE Resource Area	Temporary Impacts	Permanent Impacts	Total Impacts
WOTUS	842 ft^2	73 ft^2	915 ft^2
Limit of OHWM	275 linear feet (lf)	41 lf	316 lf

4.1 Waters of the United States

The Project will result in temporary impacts to riverbed/WOTUS associated with the Muddy Brook River. These impacts are due to dewatering activities at Muddy Brook, including the installation of pump. A control of water plan, which further details dewatering methods, can be found on Sheet 34 of the Project Design Plans (Appendix C). Permanent impacts to WOTUS are limited to drainage reconstruction, including the proposed replacement of the headwall.

4.2 Limit of OHWM

The project will result in temporary impacts to the limit of OHMW associated with Muddy Brook due to dewatering activities at Muddy Brook, including the installation of cofferdams, a 42" ductile iron (DI) bypass pipe, and a dewatering pump. No permanent impacts to the OHWM associated with Muddy Brook are proposed as part of the project.

4.3 Regulatory Floodway & 100-Year Floodplain

Portions of the Site are located within the 100-year floodplain associated with the Muddy Brook River. The base flood elevation (BFE) on the upstream side of Muddy Brook River is 267.0,' and the BFE on the downstream side of Muddy Brook is 265.5'. As a result of the Project, there will be a net gain of approximately 75 ft^3 of flood storage capacity. The Project will not alter the hydraulic capacity of the culvert. The project will not result in any permanent impacts to the Regulatory Floodway associated with Muddy Brook River.

5. Mitigation

The project was designed to avoid wetland and waterbody impacts to the maximum extent practicable. Where avoiding impacts was not feasible, MassDOT sought to minimize impacts while providing the necessary operational and safety improvements. The project will result in approximately 41 linear feet of permanent impacts to the limit of OHWM. The project will not result in any loss of aquatic resources that exceed the thresholds identified by the New England District Compensatory Mitigation Thresholds. No mitigation is proposed for the permanent impacts associated with the un-named intermittent stream.

During construction, erosion and sedimentation controls such as silt fencing and compost filter tubes (or similar) will be utilized. All erosion and sedimentation controls will be removed following completion of the work, and all disturbed areas will be permanently stabilized. Locations and details of erosion and sediment controls are shown in Appendix C. The Contractor will be required to provide a Site and

project-specific Erosion and Sediment Control Plan, Stormwater Pollution Prevention Plan (SWPPP), and Spill Prevention Control and Clean-Up (SPCC) prior to construction. The Contractor will also inspect the Site and remove any demolition debris or other construction-related materials upon completion.

Following construction, disturbed areas will be stabilized and re-vegetated with loam and seed. The seed mix will depend on the location. A short grassland mix will be utilized adjacent to lawns, sidewalks, and driveways. The proposed sediment forebay for pre-treatment with an open-graded infiltration basin and grassed channels with sediment forebays, as described in Section 3.2.1, will be seeded with a wetland seasonally flooded mix.

6. Stormwater

The proposed stormwater system has been designed to match existing drainage patterns and layout as closely as possible to minimize the impacts to the existing roadway. Existing catch basins, drainage manholes, cross culverts, and outfalls have been utilized to the maximum extent practicable. The project will result in a net increase of approximately 1.53 acres (66,646 ft^2) of impervious area. As a result of this increase, several structural Best Management Practices (BMPs) are being proposed to improve water quality, promote groundwater recharge, and enhance sediment removal within the drainage networks. The BMPs are detailed below in Table 3.

Table 3. Summary of Proposed Structural BMPs

BMP Type	Location	Impervious Catchment Area (ft^2)	Pervious Catchment Area (ft^2)
Infiltration Basin	42.102224, -71.569179	21, 919	14,989
Grass Channel with Sediment Forebays	42.110556, -71.550539	91,854	41,066
Grass Channel with Sediment Forebays	42.101591, -71.569533	1,225	5,430

Appendix D contains the Stormwater Management Report, which further details how the Project will utilize structural and non-structural control measures to manage stormwater in accordance with federal and state requirements.

6.1 Compliance with the Massachusetts Stormwater Management Standards

The Massachusetts Stormwater Management Standards are applicable under the WPA. The proposed reconstruction of the roadway and intersections within the project corridor are classified as 'redevelopment' per Standard 7 of the Massachusetts Stormwater Management Standards and must comply with standards to the maximum extent practicable. Although the proposed addition of pedestrian and bicycle accommodations is considered a 'new development,' compliance with Stormwater Management Standards is required to the maximum extent practicable (MEP) pursuant to 310 CMR 10.05(6)(m)(6), Footpaths, bike paths, and other paths for pedestrian and/or non-motorized vehicle access. Below is a summary of how the Project will comply with the Massachusetts Stormwater Management Standards.

Standard 1: No New Untreated Discharges or Erosion to Wetlands

The proposed design fully meets the requirements of Standard 1, which states that no new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. With deep sump catch basins proposed for all proposed

inlets, no new untreated discharges are proposed by the Project. The BMPs included in the proposed stormwater management system are designed in accordance with the MassDEP Stormwater Handbook.

Standard 2: Peak Rate Attenuation

The project meets Standard 2 only to the MEP. Standard 2 states that stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. The proposed BMP measures will reduce peak flows during small storm events but will provide only negligible reduction of peak flows during larger storm events. The right-of-way constraints limit the ability to provide any additional detention to fully meet the requirements of the standard. Pipe sizing calculations are included in Appendix D to demonstrate that the design provides a closed drainage network with the capacity to convey the stormwater runoff from the Project.

Standard 3: Stormwater Recharge

The proposed design fully meets the requirements of Standard 3, which states that loss of annual recharge to groundwater shall be eliminated or minimized using infiltration measures including environmentally sensitive project corridor design, low impact development techniques, stormwater BMPs, and good operation and maintenance. At a minimum, the annual recharge from the post-development project corridor shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the MassDEP Stormwater Handbook.

For discharge to the infiltration trench that will overflow to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to 44% is provided via a deep sump catch basin and open graded sediment forebay. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide compliance to the maximum extent practicable for Standards 3 and 6.

The project adds approximately 1.53 acres of impervious surface area. While only a portion of the project is within HSG B soils, the Required Recharge Volume is conservatively assumed to apply for HSG B soils at all infiltration measures within project limits, resulting in a Required Recharge Volume of 1,943 cubic feet. The surface infiltration basin includes a forebay for pretreatment that is sized for 0.1 inch of rainfall over the impervious area that drains to the basin. Static method calculations are included in Appendix D to demonstrate that the surface infiltration basin at BMP 1 and downstream sediment forebay at BMP 1 recharge 2,163 cubic feet of runoff, exceeding the Required Recharge Volume for the project's increase in impervious area. Appendix D also includes Drawdown Calculations to demonstrate that the basins will drain in less than the maximum 72 hours allowed.

Standard 4: Water Quality

The Project meets Standard 4 only to the MEP. Standard 4 states that stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:

- Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan (LTPPP), and thereafter are implemented and maintained;
- Structural stormwater BMPs are sized to capture the required water quality volume as determined in accordance with the MassDEP Stormwater Handbook; and
- Pretreatment is provided in accordance with the MassDEP Stormwater Handbook.

The Infiltration and BMP Basin Sizing Calculations are included in Appendix D. Deep sump catch basins, or a gutter inlet connecting to a manhole with a sump, are provided at all locations where a new catch basin is proposed. The portion of the project that drains to the BMPs includes 2.64 acres of impervious area, almost double the 1.53 acres of impervious area added by the project. All BMP areas are designed to provide at least 63% TSS removal, discharging less than the remainder of the project, which uses only deep sump catch basins to remove 25% TSS. Therefore, the weighted average TSS removal is less than 80%.

However, this project improves upon existing conditions by providing more water quality treatment than the current drainage system provides by providing 68% TSS removal for an impervious area larger than the impervious area added by the project. The majority of the treatment trains for BMP areas provide TSS removal in excess of 80%, and a table showing the TSS removal for each BMP treatment train is included in the table below. A LTPP is not included because the design requires no post-construction actions beyond MassDOT's standard maintenance activities.

Table 4. Water Quality Treatment

Catchment	Impervious Area (SF)	Water Quality Treatment (%)
BMP 2 Road	91,854	63%
BMP 1 Road	16,174	94%
BMP 1 Basin Direct Flow	1,544	93%

The downstream basin of BMP 2 (the BMP with the largest contributing drainage area), after conveying through the designed grass channel, ultimately discharges to an existing grassed conveyance ditch that will remain in place beyond the grading limits of BMP 2. While no credit is claimed in the calculation for treatment by the existing swale, conveyance in natural grass channels has additional potential stormwater quality and recharge benefits.

For discharge to the outfall to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to at least 25% is provided via a deep sump catch basins. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for BMP management and recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standards 4 and 6.

All measures designed for infiltration are designed for the 1-inch water quality volume, and all conveyance measures with TSS removal credit are designed for the water quality flow resulting from a 1-inch, 24-hour storm. Calculations demonstrating compliance with the standards in the MassDEP BMP manual for all measures removing suspended solids from runoff are included in Appendix D.

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

The proposed design fully meets the requirements of Standard 5, which states that for LUHPPLs, source control and pollution prevention shall be implemented in accordance with the MassDEP Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the MEP. None of the land uses within the project limits have higher potential pollutant loads.

Standard 6: Critical Areas

As a Redevelopment Project, the project meets the 44% TSS removal pretreatment requirements of Standard 6 only to the maximum extent practicable, but fully meets the 1-inch water quality volume requirement for all designed infiltration areas. The grassed channel in BMPs 1 and 2 are designed for the appropriate water quality flow draining to each, as well as the other standards outlined in the MassDEP Stormwater Handbook. Standard 6 states that stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas. Portions of the project discharge to a Coldwater Fishery Resource as designated by the Massachusetts Division of Fisheries and Wildlife (Muddy Brook). Given constraints in grading, available ROW, and the goal of minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for specified BMP measures, including pretreatment, infiltration, and TSS removal, could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standard 6.

Standard 7: Redevelopment and Other Projects Subject to the Standards Only to the Maximum Extent Practicable

Standard 7 states that a redevelopment project is required to meet the following Massachusetts Stormwater Management Standards only to the MEP: Standard 2, Standard 3, and the pretreatment and structural BMP requirements of Standards 4, 5, and 6. Existing stormwater discharges would comply with Standard 1 only to the MEP. The proposed redevelopment project would also comply with Standards 2, 3, 4, and 6 to the MEP, as noted with project restraints. All other requirements of the Stormwater Management Standards will be met by the proposed work and improve existing conditions.

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

The Project fully complies with Standard 8, which states that a plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented. The Project will obtain coverage under the Massachusetts National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP). As required under this permit, a SWPPP will be developed and submitted before land disturbance begins. The SWPPP will be developed by the contractor according to the MassDOT's specifications and will include the following:

- Construction period pollution prevention measures;

- Erosion and sedimentation control plan drawings;
- Detailed drawings and specifications for erosion control BMPs and sizing calculations;
- An operation and maintenance plan for erosion and sedimentation controls;
- An inspection schedule; and
- A maintenance schedule.

Standard 9: Operations & Maintenance Plan

The Project fully meets the requirements of Standard 9, which states that a long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed. A project-specific Post Construction Operation and Maintenance Plan is not included because the design requires no post-construction actions beyond MassDOT's standard maintenance activities.

Standard 10: Prohibition of Illicit Discharges

The Project is designed to fully comply with Standard 10, which states that all illicit discharges to the stormwater management system are prohibited. The Project will be designed to be in full compliance with current standards. Any property owners identified with illicit connections will be contacted by MassDOT and disconnected from the MassDOT system unless the property owner obtains the required permits for the connection. An Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to post-construction BMPs.

7. Alternatives Analysis

MassDOT evaluated several Route 16 corridor design options during the development of the Build Alternative with respect to safety, operations, environmental impacts, and right-of-way acquisition. As described below, the Preferred Alternative was selected as it best met project purpose and need while minimizing impacts to environmental resources and adjacent right-of-way to the maximum extent practicable.

7.1 Alternative 1 (No-Build)

A No-Build Alternative was evaluated to determine how the transportation system would operate if the proposed project were not built, thus serving to compare the effects of the Build Alternative. The No-Build Alternative would not provide any roadway improvements beyond regularly scheduled routine maintenance, such as roadway resurfacing, striping, and signage upgrades. Additionally, safety and operational issues attributed to substandard roadway design elements would persist. The No-Build Alternative is not considered a reasonable alternative as it fails to satisfy the purpose and need of the proposed action.

7.2 Alternative 2 (Buffered Bike Lanes)

Alternative 2 proposes buffered bike lanes on both sides of Route 16. These bike lanes are at the same grade as the travel lanes and are separated from vehicular traffic by a painted buffer. The corridor from Hartford Avenue West to the Hopedale town line would consist of an 11-foot travel lane, a 5-foot bike

lane, and a 3-foot buffer in each direction. A 6-foot sidewalk was proposed on both sides of the roadway. Providing buffered bike lanes and pedestrian accommodations on both sides of the road would result in a wider total corridor cross-section with greater impacts to existing wetlands than the current design. Therefore, Alternative 2 was dismissed.

7.3 Alternative 3 (Shared-Use Path, Preferred Alternative)

Alternative 3 includes a shared-use path that provides pedestrians and bicyclists an off-street alternative to move along the corridor. The corridor from Hartford Avenue West to the Hopedale town line will consist of two 11-foot travel lanes with 5-foot shoulders in the westbound direction and 2-foot shoulders in the eastbound direction. An 8-foot shared-use path with a landscaped buffer is proposed along the south side of Route 16. A 7-foot sidewalk is proposed along the north side of the roadway between Hartford Avenue West and North Avenue. The shared-use path option was selected as the preferred alternative because it proposes fewer impacts to jurisdictional resource areas and allows for increased safety benefits from separating the bicycle accommodations from the roadway.

8. Fisheries and Wildlife

A portion of the project corridor (approximately 0.75 acres, 32,872.5 ft^2) is located within the Massachusetts Natural Heritage and Endangered Species Program Estimated Habitat of Rare Wildlife area (EH 673) and Priority Habitat of Rare Species area (PH 858) associated with Muddy Brook. The project will not result in any adverse effects to habitat, as the project's area of disturbance is associated with disturbed and degraded right-of-way. As described in Section 7.0, there are no practicable or substantially equivalent alternatives for the Project, and the proposed activities improve existing conditions.

According to a November 2022 and December 2023 search of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) database, the federally endangered northern long-eared bat (NLEB) (*Myotis septentrionalis*) is potentially present within the project corridor. The project received a Not Likely to Adversely Affect (NLAA) Concurrence Letter from the USFWS for NLEB in November 2022, and a No Effect Concurrence Letter from the USFWS for NLEB in 2023, via the Federal Highway Administration Programmatic Biological Opinion (PBO) (refer to Appendix E).

According to a subsequent search of the IPaC database conducted in August 2024, NLEB are no longer likely to be present within the project corridor. The IPaC identified the potential presence of Tricolored bat (TCB) (*Perimyotis subflavus*) within the project corridor. The USFWS has proposed to list the TCB *endangered* under the Endangered Species Act (ESA). In advance of the uplisting of the TCB to endangered later this year, MassDOT will employ several avoidance and minimization measures in compliance with the ESA (refer to Appendix E). The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and TCB, including all Avoidance and Minimization Measures (AMMs). In accordance with the project specifications, the contractor must be sure to direct temporary lighting away from suitable habitat during the active season: April 1 to October 31, and that no tree cutting will be conducted during the active season, or that if cutting inside of this timeframe is required, tree removal is limited to 10 or fewer trees per project at any time of year within 100 feet of existing road/rail surface and outside of documented roosting/foraging habitat or travel corridors; with a survey completed to ensure no bats were observed.

Attachment F

USFWS Correspondence

1. Email Correspondence
2. No Effect Determination Letters

Proposal No. 608491-131468

From: Santiago, Damaris (FHWA) <Damaris.Santiago@dot.gov>
Sent: Monday, December 23, 2024 2:49 PM
To: FHWA-#ALLDA-OfficialMailbox <FHWA-ALLDA-OfficialMailbox@dot.gov>; FHWA-#ALLFLH-OfficialMailbox <FHWA-ALLFLH-OfficialMailbox@dot.gov>
Cc: FHWA-#ALLDFS-PersonalMailbox <FHWA-ALLDFS-PersonalMailbox@dot.gov>; FHWA-#ALLDFS-PersonalMailbox <FHWA-ALLDFS-PersonalMailbox@dot.gov>; FHWA-#ALLDEPDA-PersonalMailbox <FHWA-#ALLDEPDA-PersonalMailbox@dot.gov>; HEPODs <HEPODs@dot.gov>; HEPTEAMS <HEPTEAMS@dot.gov>; FHWA DSS Environment (FHWA) <FieldEnvironment@dot.gov>; Smoker, Matt (FHWA) <matt.smoker@dot.gov>; Biondi, Emily (FHWA) <Emily.Biondi@dot.gov>
Subject: INFORMATION: New 2024 Programmatic Biological Opinion/Conference Opinion for Transportation Projects Affecting Bats

TO THE ATTENTION OF DIVISION ADMINISTRATORS AND ENVIRONMENTAL STAFF

The purpose of this message is to announce that the U.S. Fish and Wildlife Service (USFWS) finalized a 2024 Programmatic Biological Opinion/Conference Opinion for Transportation Projects in the Range of the endangered Indiana Bat, endangered Northern Long-Eared Bat (NLEB), and proposed endangered Tricolored Bat (TCB) under section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA). FHWA has been working with USFWS to update the amended 2018 Programmatic Biological Opinion for Transportation Projects in the Range of the Indiana Bat and NLEB (amended 2018 Range-wide PBO) and conference on the proposed endangered TCB. This email provides an overview of the 2024 Programmatic Biological & Conference Opinion (PBO/PCO) and clarifies our recommendations for Section 7 consultation on these species.

Please share this announcement with your state and local counterparts. Note that the 2024 Range-wide PBO/PCO is for projects that are authorized, funded, or carried out by FHWA, FRA, and FTA.

The 2024 Range-wide PBO/PCO includes many updates and modifications to the amended 2018 Range-wide PBO. Here are some of the major modifications:

- Addresses projects that "may affect" the TCB;
- Covers several activities that extended beyond 300 feet of the road/rail surface;
- Recognizes potential effects to the NLEB and TCB during the winter in areas where the bats are active year-round;
- Clarifies many definitions and activity types;
- Identifies minimum culvert sizes that may be used by bats consistent with the USFWS's Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines;
- Incorporates compensatory mitigation for NLEB for adverse effects of active season habitat removal/trimming; and
- The compensatory mitigation ratio tables have been updated to cover the NLEB and additional effects of activities beyond 300 feet of the road/rail surface.

For projects that have previously undergone consultation with the USFWS on effects to the Indiana bat or the NLEB, all consultations remain valid and in effect. For projects that require but have not yet initiated consultation on either the Indiana bat, NLEB, or TCB, consultation may be completed using the 2024 Range-wide PBO, if applicable. Implementation information is available at the USFWS's website: https://www.fws.gov/program/endangered-species/bat-consultation-conservation-strategy.

The USFWS's Assisted Determination Key associated with the amended 2018 Range-wide PBO is no longer available. A new Assisted Determination Key associated with the 2024 Range-wide PBO/PCO is expected to be available in mid to late February 2025 (https://ipac.ecosphere.fws.gov/). Users can wait until the new Assisted Determination Key is available, or submit projects to the USFWS Local Field Office via a hard copy submittal form (User Guide Appendix B - https://www.fws.gov/media/users-guide-range-wide-programmatic-consultation-indiana-bat-and-northern-long-eared-bat).

FHWA will deliver outreach webinars in late February to provide technical assistance on the implementation of the 2024 Range-wide PBO, demonstrate the use of the new Assisted Determination Key, and carry out a Q&A session. Webinar dates, times and other details will be announced in a follow-up email.

Damaris Santiago (she|her)
Director

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: November 04, 2022
Project code: 2022-0071703
Project Name: 608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16

Subject: Concurrence verification letter for the '608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16' project under the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated November 04, 2022 to verify that the **608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16** (Proposed Action) may rely on the concurrence provided in the February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action is within the scope and adheres to the criteria of the PBO, including the adoption of applicable avoidance and minimization measures, and may affect, but is not likely to adversely affect (NLAA) the endangered Indiana bat (*Myotis sodalis*) and/or the threatened Northern long-eared bat (*Myotis septentrionalis*). Consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) is required.

The Service has 14 calendar days to notify the lead Federal action agency or designated non-federal representative if we determine that the Proposed Action does not meet the criteria for a NLAA determination under the PBO. If we do not notify the lead Federal action agency or designated non-federal representative within that timeframe, you may proceed with the Proposed Action under the terms of the NLAA concurrence provided in the PBO. This verification period allows Service Field Offices to apply local knowledge to implementation of the PBO, as we may identify a small subset of actions having impacts that were unanticipated. In such instances,

Service Field Offices may request additional information that is necessary to verify inclusion of the proposed action under the PBO.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities: If your initial bridge/culvert or structure assessments failed to detect Indiana bats, but you later detect bats prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office. In these instances, potential incidental take of Indiana bats may be exempted provided that the take is reported to the Service.

If the Proposed Action is modified, or new information reveals that it may affect the Indiana bat and/or Northern long-eared bat in a manner or to an extent not considered in the PBO, further review to conclude the requirements of ESA Section 7(a)(2) may be required. If the Proposed Action may affect any other federally-listed or proposed species, and/or any designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please contact this Service Office.

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Candidate

Project Description

The following project name and description was collected in IPaC as part of the endangered species review process.

Name

608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16

Description

608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16
Project limits extend from Taft Avenue in Mendon to the Mendon/Hopedale Town Line, a distance of 1.9 miles. The project involves roadway resurfacing with minor box widening as well as bike and pedestrian improvements. Intersection improvements include two new signals at Hartford Avenue West and Maple Street, and a signal upgrade at North Avenue.
Monarch Butterfly: Candidate Species only, no conservation measures at this time.

Determination Key Result

Based on your answers provided, this project(s) may affect, but is not likely to adversely affect the endangered Indiana bat and/or the threatened Northern long-eared bat, therefore, consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required. However, also based on your answers provided, this project may rely on the concurrence provided in the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

Qualification Interview

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the Northern long-eared bat[1]?

   [1] See Northern long-eared bat species profile

   Automatically answered
   Yes

3. Which Federal Agency is the lead for the action?

   A) Federal Highway Administration (FHWA)

4. Are *all* project activities limited to non-construction[1] activities only? (examples of non-construction activities include: bridge/abandoned structure assessments, surveys, planning and technical studies, property inspections, and property sales)

   [1] Construction refers to activities involving ground disturbance, percussive noise, and/or lighting.

   No

5. Does the project include *any* activities that are **greater than** 300 feet from existing road/rail surfaces[1]?

   [1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

   No

6. Does the project include *any* activities **within** 0.5 miles of a known Indiana bat and/or NLEB hibernaculum[1]?

   [1] For the purpose of this consultation, a hibernaculum is a site, most often a cave or mine, where bats hibernate during the winter (see suitable habitat), but could also include bridges and structures if bats are found to be hibernating there during the winter.

   No

7. Is the project located **within** a karst area?

   No

8. Is there *any* suitable[1] summer habitat for Indiana Bat or NLEB **within** the project action area[2]? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   [2] The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR Section 402.02). Further clarification is provided by the User's Guide for the Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat.

   Yes

9. Will the project remove *any* suitable summer habitat[1] and/or remove/trim any existing trees **within** suitable summer habitat?

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   Yes

10. Will the project clear more than 20 acres of suitable habitat per 5-mile section of road/rail?

    No

11. Have presence/probable absence (P/A) summer surveys[1][2] been conducted[3][4] **within** the suitable habitat located within your project action area?

    [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

    [2] Presence/probable absence summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate distance from hibernacula) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    [3] For projects within the range of either the Indiana bat or NLEB in which suitable habitat is present, and no bat surveys have been conducted, the transportation agency will assume presence of the appropriate species. This assumption of presence should be based upon the presence of suitable habitat and the capability of bats to occupy it because of their mobility.

    [4] Negative presence/probable absence survey results obtained using the summer survey guidance are valid for a minimum of two years from the completion of the survey unless new information (e.g., other nearby surveys) suggest otherwise.

    Yes

SUBMITTED DOCUMENTS

- *608491_rpt_mendon_nleb_survey_20210922.pdf https://ipac.ecosphere.fws.gov/project/5DMAN7E2P5FVDJ3DP4HOSHEF44/projectDocuments/115741894*

12. Did the presence/probable absence (P/A) summer surveys detect Indiana bats and/or NLEB[1]?

    [1] P/A summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate home range) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    No

13. Were the P/A summer surveys conducted **within** the fall swarming/spring emergence range of a documented Indiana bat hibernaculum[1]?

    [1] Contact the local Service Field Office for appropriate distance from hibernacula.

    No

14. Does the project include activities **within documented NLEB habitat**[1][2]?

    [1] Documented roosting or foraging habitat – for the purposes of this consultation, we are considering documented habitat as that where Indiana bats and/or NLEB have actually been captured and tracked using (1) radio telemetry to roosts; (2) radio telemetry biangulation/triangulation to estimate foraging areas; or (3) foraging areas with repeated use documented using acoustics. Documented roosting habitat is also considered as suitable summer habitat within 0.25 miles of documented roosts.)

    [2] For the purposes of this key, we are considering documented corridors as that where Indiana bats and/or NLEB have actually been captured and tracked to using (1) radio telemetry; or (2) treed corridors located directly between documented roosting and foraging habitat.

    No

15. Will the removal or trimming of habitat or trees occur **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors?

    Yes

16. What time of year will the removal or trimming of habitat or trees **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors occur?

    C) During both the active and inactive seasons

17. Will *any* tree trimming or removal occur **within** 100 feet of existing road/rail surfaces?

    Yes

18. Will *any* tree trimming or removal occur **between** 100-300 feet of existing road/rail surfaces?

    No

19. Are *all* trees that are being removed clearly demarcated?

    Yes

20. Will the removal of habitat or the removal/trimming of trees involve the use of **temporary** lighting?

    Yes

21. Will the removal of habitat or the removal/trimming of trees include installing new or replacing existing **permanent** lighting?

    No

22. Does the project include wetland or stream protection activities associated with compensatory wetland mitigation?

    No

23. Does the project include slash pile burning?

    No

24. Does the project include *any* bridge removal, replacement, and/or maintenance activities (e.g., any bridge repair, retrofit, maintenance, and/or rehabilitation work)?

    No

25. Does the project include the removal, replacement, and/or maintenance of *any* structure other than a bridge? (e.g., rest areas, offices, sheds, outbuildings, barns, parking garages, etc.)

    No

26. Will the project involve the use of *any* **temporary** lighting in addition to the lighting already indicated for habitat removal (including the removal or trimming of trees), or bridge/structure removal, replacement or maintenance activities?

    Yes

27. Is there *any* suitable habitat **within** 1,000 feet of the location(s) where **temporary** lighting (other than the lighting already indicated for habitat removal (including the removal or trimming of trees) or bridge/structure removal, replacement or maintenance activities) will be used?

    Yes

28. Will the project install new or replace existing **permanent** lighting?

    No

29. Does the project include percussives or other activities (**not including tree removal/ trimming or bridge/structure work**) that will increase noise levels above existing traffic/ background levels?

    Yes

30. Will the activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the active season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

31. Will *any* activities that use percussives (**not including tree removal/trimming or bridge/structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the inactive season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

32. Are *all* project activities that are **not associated with** habitat removal, tree removal/trimming, bridge and/or structure activities, temporary or permanent lighting, or use of percussives, limited to actions that DO NOT cause any additional stressors to the bat species?

    Examples: lining roadways, unlighted signage , rail road crossing signals, signal lighting, and minor road repair such as asphalt fill of potholes, etc.

    Yes

33. Will the project raise the road profile **above the tree canopy**?

    No

34. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the active season within undocumented habitat.

35. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) and/or increase noise levels above existing traffic/background levels consistent with a No Effect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the inactive season

36. Is the location of this project consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because no bats were detected during presence/probable absence surveys conducted during the summer survey season and outside of the fall swarming/spring emergence periods. Additionally, all activities were at least 0.5 miles from any hibernaculum.

37. **General AMM 1**
    Will the project ensure *all* operators, employees, and contractors working in areas of known or presumed bat habitat are aware of *all* FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable Avoidance and Minimization Measures?

    Yes

Project Questionnaire

1. Have you made a No Effect determination for *all* other species indicated on the FWS IPaC generated species list?

   N/A

2. Have you made a May Affect determination for *any* other species on the FWS IPaC generated species list?

   N/A

3. How many acres[1] of trees are proposed for removal between 0-100 feet of the existing road/rail surface?

   [1] If described as number of trees, multiply by 0.09 to convert to acreage and enter that number.

   1.5

Avoidance And Minimization Measures (AMMs)

This determination key result includes the committment to implement the following Avoidance and Minimization Measures (AMMs):

GENERAL AMM 1

Ensure all operators, employees, and contractors working in areas of known or presumed bat habitat are aware of all FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable AMMs.

Determination Key Description: FHWA, FRA, FTA Programmatic Consultation For Transportation Projects Affecting NLEB Or Indiana Bat

This key was last updated in IPaC on April 28, 2022. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the threatened **Northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

IPaC User Contact Information

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Name: Trevor Burns
Address: 10 Park Plaza
City: Boston
State: MA
Zip: 02116
Email trevor.b.burns@dot.state.ma.us
Phone: 8574885122

Lead Agency Contact Information

Lead Agency: Federal Highway Administration

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: December 07, 2023
Project code: 2024-0024175
Project Name: Resurfacing and Related Work on Route 16 (Uxbridge Road)

Subject: Consistency letter for the 'Resurfacing and Related Work on Route 16 (Uxbridge Road)' project under the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (NLEB).

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated December 07, 2023 to verify that the **Resurfacing and Related Work on Route 16 (Uxbridge Road)** (Proposed Action) may rely on the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action will have no effect on the endangered Indiana bat (*Myotis sodalis*) or the endangered northern long-eared bat (*Myotis septentrionalis*). If the Proposed Action is not modified, **no consultation is required for these two species.** If the Proposed Action is modified, or new information reveals that it may affect the Indiana bat and/or northern long-eared bat in a manner or to an extent not considered in the PBO, further review to conclude the requirements of ESA section 7(a)(2) may be required.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities:
If your initial bridge/culvert or structure assessment failed to detect Indiana bats and/or NLEBs use or occupancy, yet later detected prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office within 2 working days of the incident. In these instances, potential incidental take of Indiana bats and/or NLEBs may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species and/or designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please advise the lead Federal action agency accordingly.

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Candidate

PROJECT DESCRIPTION

The following project name and description was collected in IPaC as part of the endangered species review process.

NAME

Resurfacing and Related Work on Route 16 (Uxbridge Road)

DESCRIPTION

MassDOT is proposing to reconstruct and resurface Route 16 in Mendon, Massachusetts (Site). The Site consists of 1.9 miles of Route 16 between Taft Avenue and the Hopedale Town Line. In addition to the main project corridor, the following intersections and their roadway approaches constitute the project limits:

- Route 16 and Hartford Avenue West
- Route 16 and Millville Street
- Route 16 and Emerson Street / Washington Street
- Route 16 and Maple Street
- Route 16 and Main Street / North Avenue

Work will include pavement repair and resurfacing, bicycle and pedestrian accommodations including a shared-use path, and reconstruction of the signalized intersections to include new traffic signal equipment and address issues from previous road safety audits.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.11111545,-71.55009150872718,14z



DETERMINATION KEY RESULT

Based on the information you provided, you have determined that the Proposed Action will have no effect on the endangered Indiana bat and/or the endangered northern long-eared bat. Therefore, no consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required for these two species.

QUALIFICATION INTERVIEW

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the northern long-eared bat[1]?

   [1] See northern long-eared bat species profile

   Automatically answered
   Yes

3. [Semantic] Does your proposed action intersect an area where Indiana bats and northern long-eared bats are not likely to occur?

   Automatically answered
   Yes

DETERMINATION KEY DESCRIPTION: FHWA, FRA, FTA PROGRAMMATIC CONSULTATION FOR TRANSPORTATION PROJECTS AFFECTING NLEB OR INDIANA BAT

This key was last updated in IPaC on October 30, 2023. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the endangered **northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

IPAC USER CONTACT INFORMATION

Agency: Massachusetts Department of Transportation
Name: Jessica Rebholz
Address: 31 Saint James Avenue, Suite 400
City: Boston
State: MA
Zip: 02116
Email rebholz.jessica@gmail.com
Phone: 2035361833

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

Attachment G

Muddy Brook Culvert - Hydraulic Analysis Report

Mendon Route 16

Project File No. 608491

Muddy Brook Culvert Analysis

Prepared for:

Massachusetts Department of Transportation
Highway Division

February 2024

Prepared by
HNTB Corporation

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1.2 Project Description 2

Appendices

- Appendix A
  - Culvert Repair Plans
- Appendix B
  - FEMA Flood Data

1. Introduction

1.1 Objectives of Report

This report is intended to provide closeout to previous comments made on hydraulic reports submitted with the 25% and 75% submissions for this project, as the scope of the culvert work on the project has changed since those submissions.

1.2 Project Description

The Massachusetts Department of Transportation (MassDOT) proposes resurfacing and related work along Route 16 in the Town of Mendon from Taft Avenue to the Hopedale town line. Route 16 is a major roadway that runs through Mendon and experiences safety concerns at the intersections and heavy traffic volumes, especially during morning and afternoon rush hours.

The related work includes the addition of a shared use path on the south side of the road, improvements to the existing sidewalk on the north side, along with intersection improvements, two new traffic signals at Hartford Avenue West and Maple Street, and a signal upgrade at North Avenue. The purpose of these roadway improvements is to increase safety and mobility for vehicles, cyclists, and pedestrians.

The roadway improvements include 11' travel lanes, 10' shared use path (SUP), and a 4' grass buffer. The roadway improvements have been modified from previous submissions atop the Muddy Brook culvert, to accommodate keeping the existing culvert in place with no modification, other than repair.

The scope of the culvert work on the project **has shifted to be culvert repair only,** based on several conversations with MassDOT, to avoid impacts to a federal floodway**.** We will be maintaining the exact culvert limits, location, size, and inverts as in the existing condition – the only work proposed on the culvert will be what is necessary to perform the required repairs, and maintain a compliant design for the new roadway over top of the culvert.

No modifications are proposed to the hydraulic openings of the culverts on either side, and no length will be added.

Appendix A

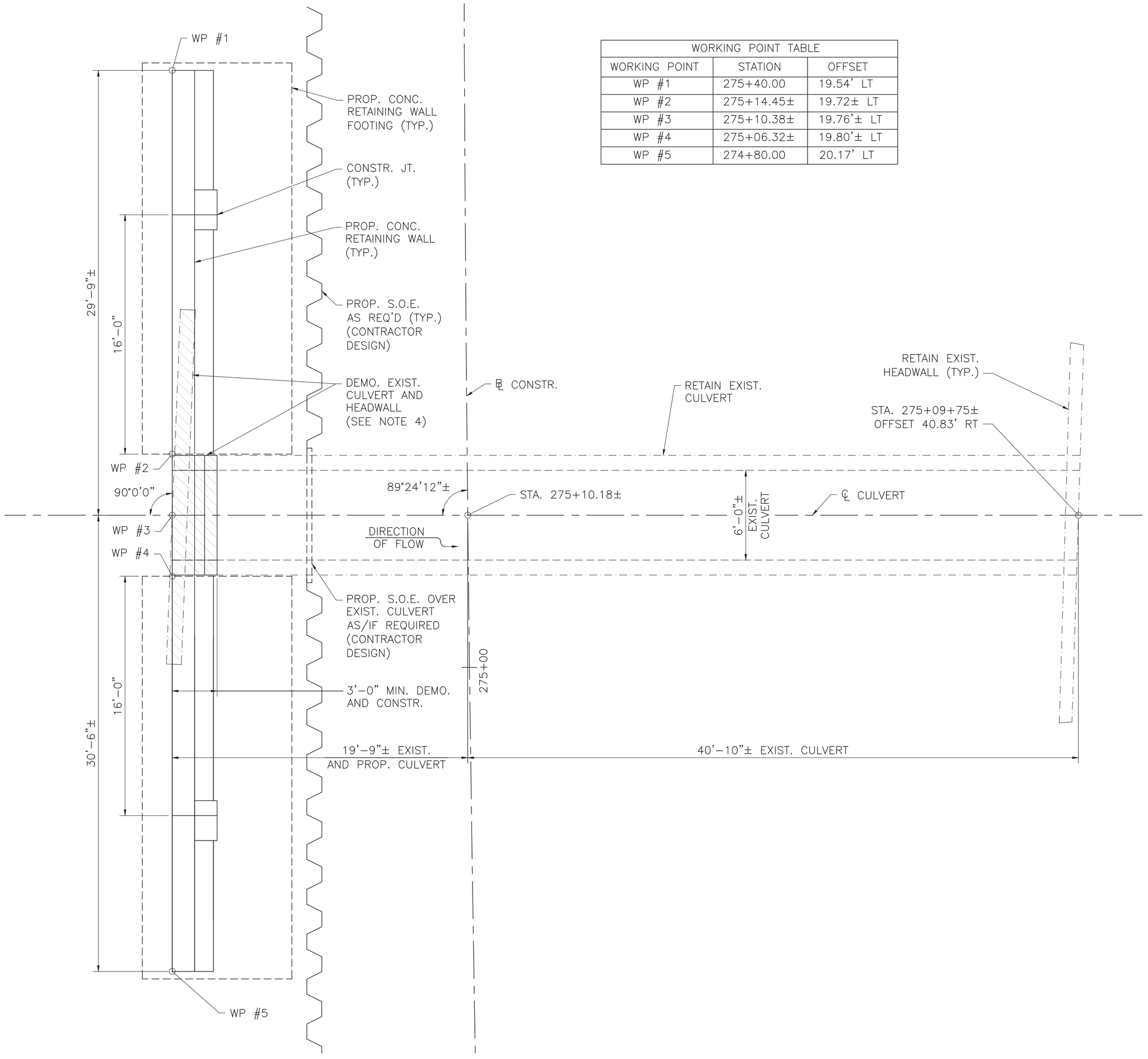
Culvert Repair Plans

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	192	314
PROJECT FILE NO.	608491		

CULVERT PLAN

WORKING POINT TABLE		
WORKING POINT	STATION	OFFSET
WP #1	275+40.00	19.54' LT
WP #2	275+14.45±	19.72± LT
WP #3	275+10.38±	19.76'± LT
WP #4	275+06.32±	19.80'± LT
WP #5	274+80.00	20.17' LT



MUDDY BROOK CULVERT PLAN
SCALE $\frac{1}{4}$" = 1'-0"

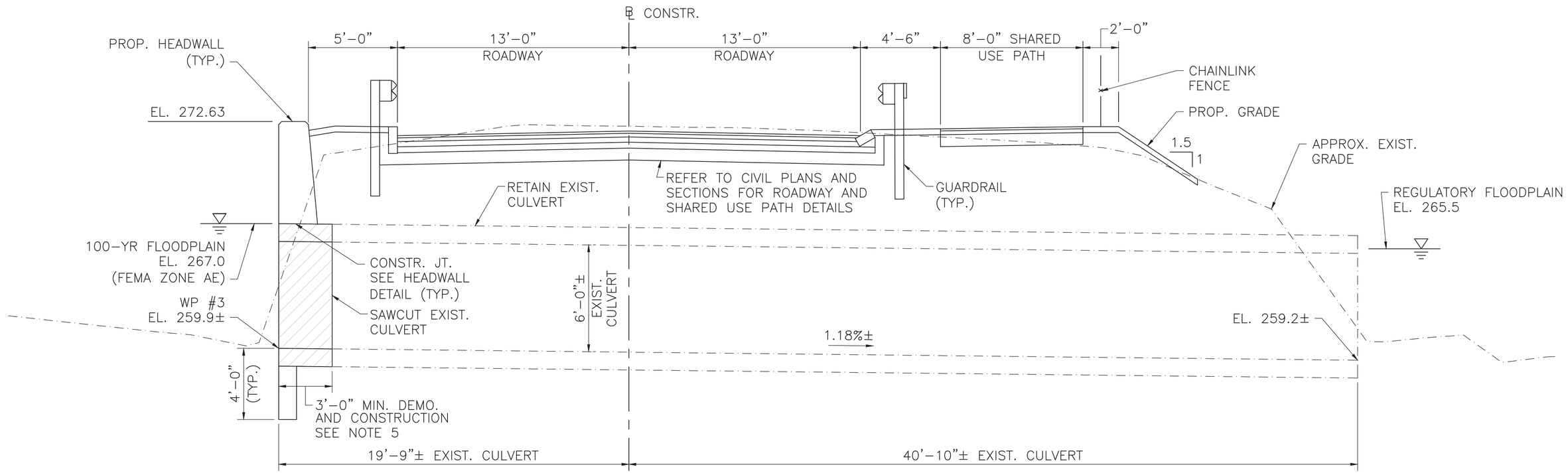
NOTES:

1. SUPPORT OF EXCAVATION (SHEETING, PILES, ETC.) SHALL BE CUT OFF A MINIMUM OF 2 FEET BELOW PROPOSED GRADE IF LEFT IN PLACE.
2. SEE SHEET 195 FOR RETAINING WALL DETAILS.
3. SEE SHEET 200 FOR CONTROL OF WATER DETAILS AND HYDRAULIC DATA.
4. LIMITS OF EXISTING RETAINING HEADWALLS AND ANY ASSOCIATED FOOTINGS BELOW GRADE ARE UNKNOWN. SUPPORT OF EXCAVATION AS SHOWN MAY REQUIRE MODIFICATION TO AVOID CONFLICTS WITH EXISTING STRUCTURE.
5. REFER TO SHEET 61 FOR RTE. 146 PROFILE OVER CULVERT. REFER TO SHEET 193 FOR EXISTING CULVERT PROFILE.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE AND PROTECTION OF UNDERGROUND UTILITIES AND/OR STRUCTURES IN THE AREA OF CONSTRUCTION.

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MA	-	193	314
PROJECT FILE NO.	608491		

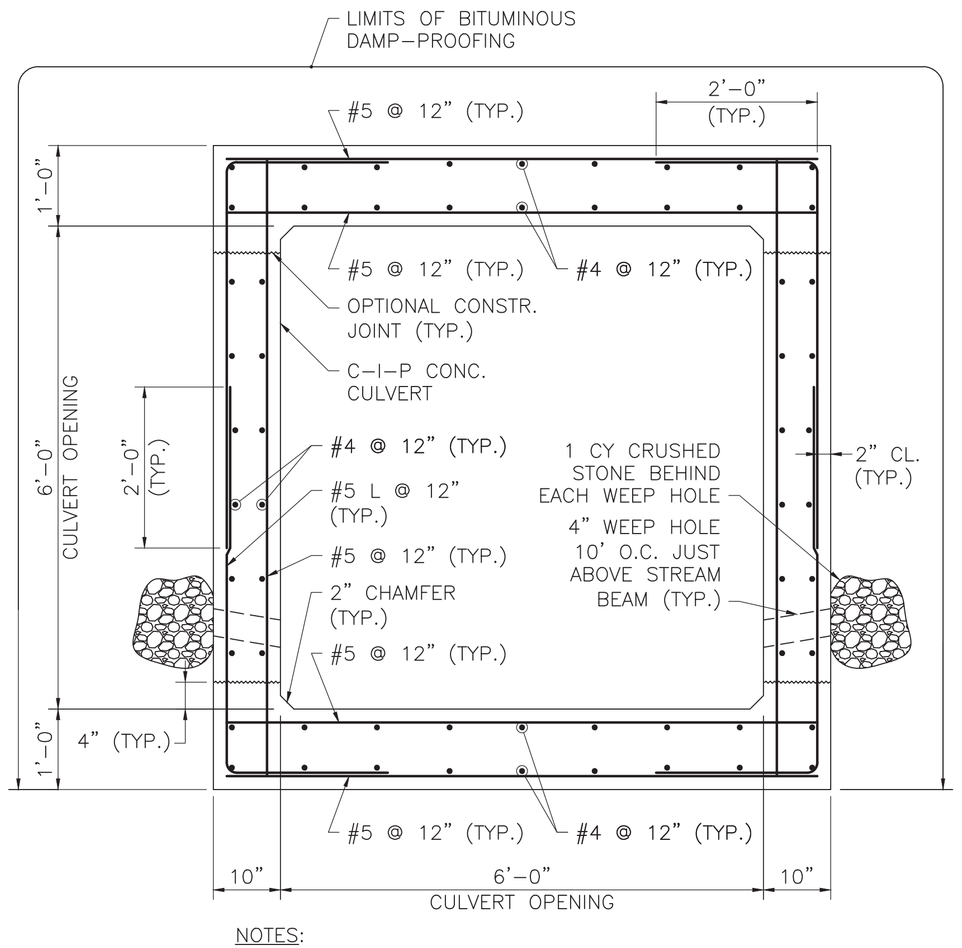
CULVERT LONG. SECTION AND DETAILS



MUDDY BROOK LONGITUDINAL SECTION
(LOOKING UP STATION)
SCALE ¼" = 1'–0"

NOTES:

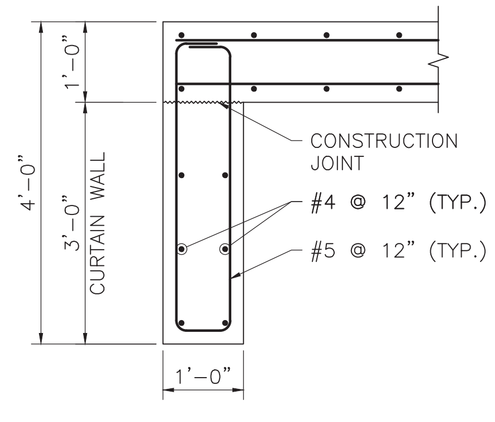
1. ALL CONCRETE SHALL BE 4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE.
2. SEE SHEET 192 FOR ADDITIONAL NOTES.
3. CULVERT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
4. TRANSVERSE REINFORCEMENT SHALL BE PLACED NORMAL TO THE CENTERLINE OF THE CULVERT.
5. DEMOLITION OF EXISTING CULVERT AT THE EAST END SHALL EXTEND A MINIMUM OF 3'–0" AS SHOWN. CULVERT DEMOLITION SHALL EXTEND TO SOUND CONCRETE SECTION BEYOND THE LIMITS OF CRACKING AND SPALLING TO THE EXISTING CULVERT.



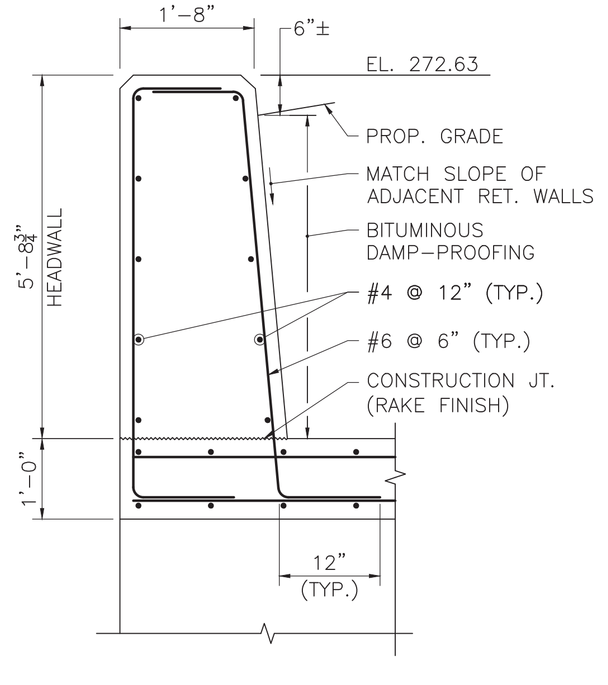
NOTES:

1. MAXIMUM FACTORED BEARING PRESSURE = 3 KSF.
2. FACTORED BEARING RESISTANCE = 6 KSF.

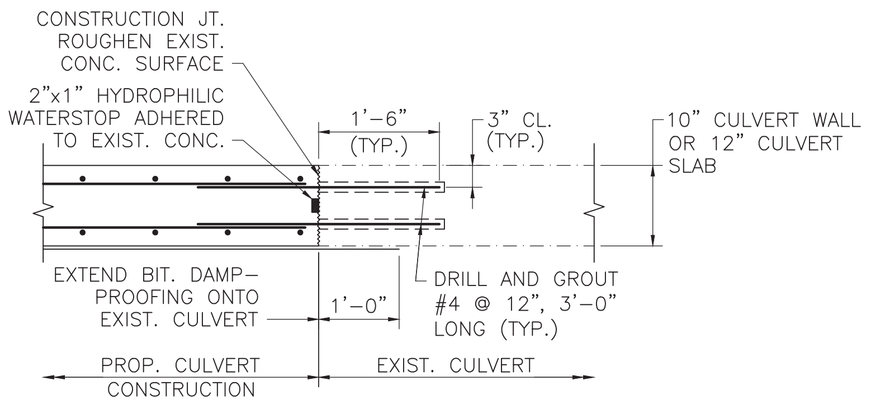
PROPOSED CULVERT SECTION
SCALE ¾" = 1'–0"



CURTAIN WALL DETAIL
SCALE ¾" = 1'–0"



HEADWALL DETAIL
SCALE ¾" = 1'–0"



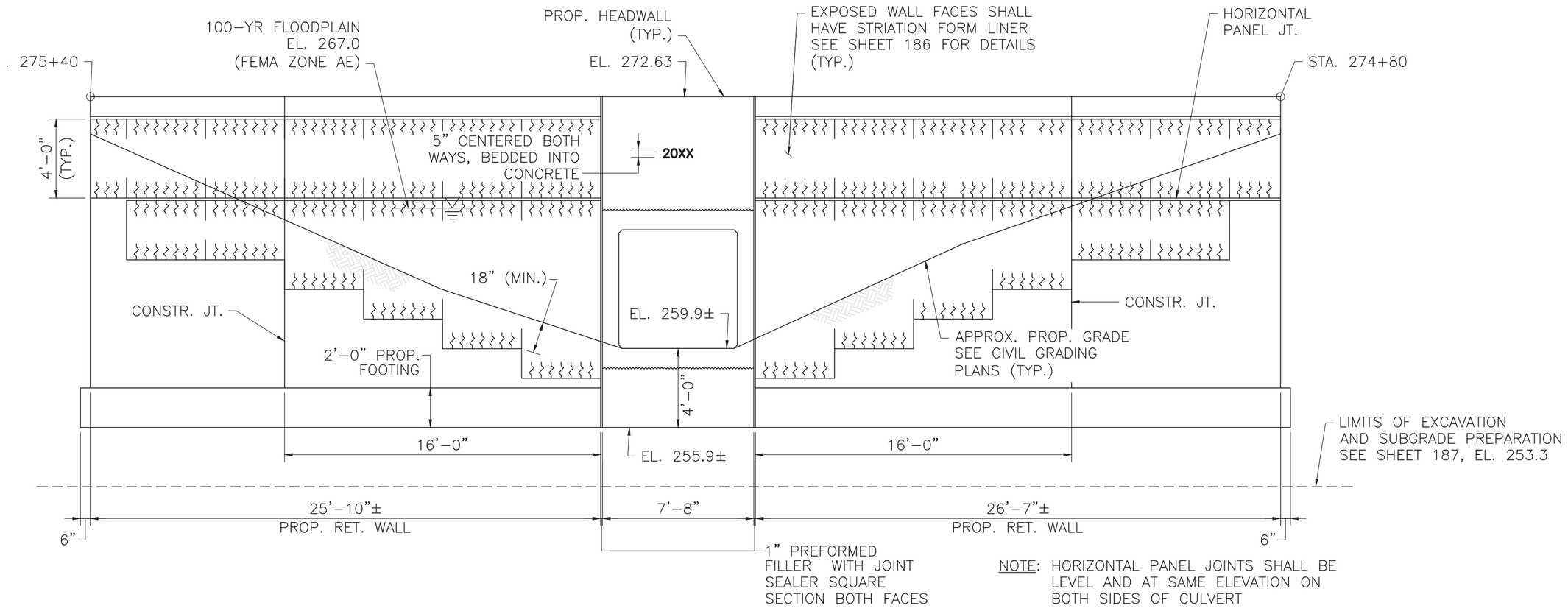
EXISTING CULVERT CONNECTION
SCALE ¾" = 1'–0"

Proposal No. 608491-131468
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STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	194	314
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CULVERT ELEVATION



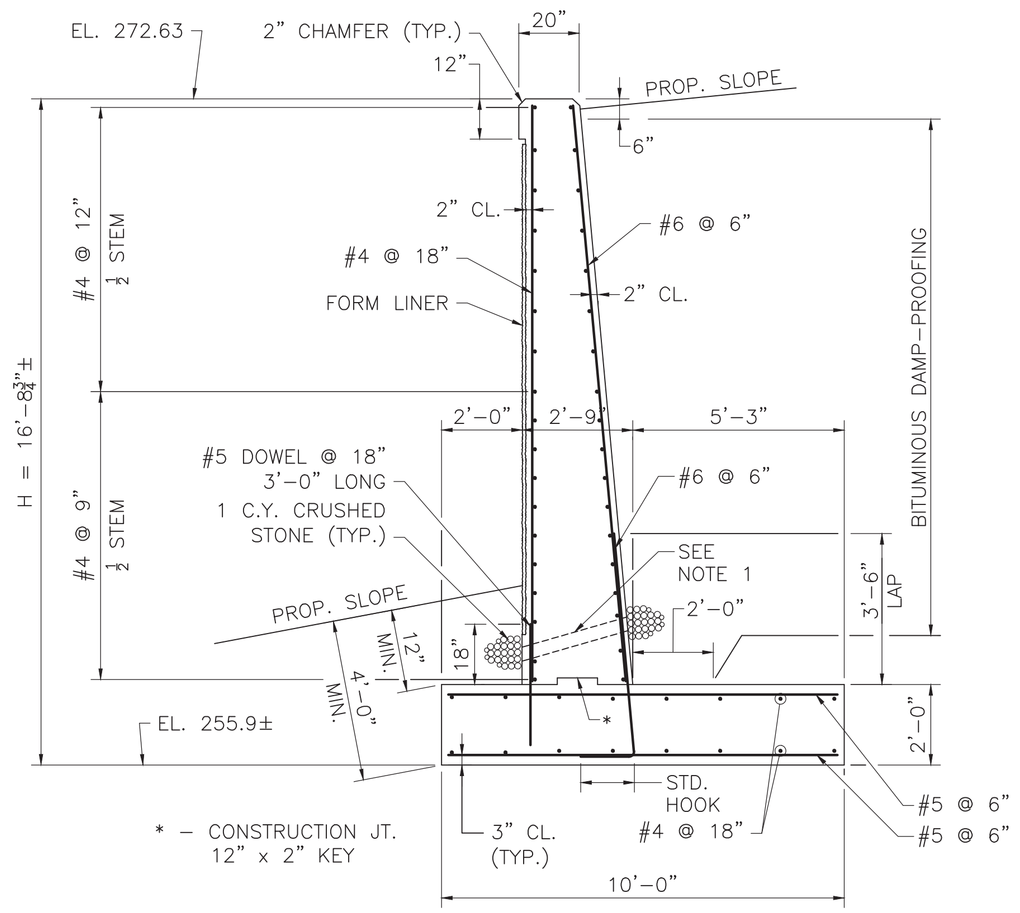
MUDDY BROOK CULVERT WEST ELEVATION
SCALE $\frac{1}{4}$" = 1'–0"

Proposal No. 608491-131468

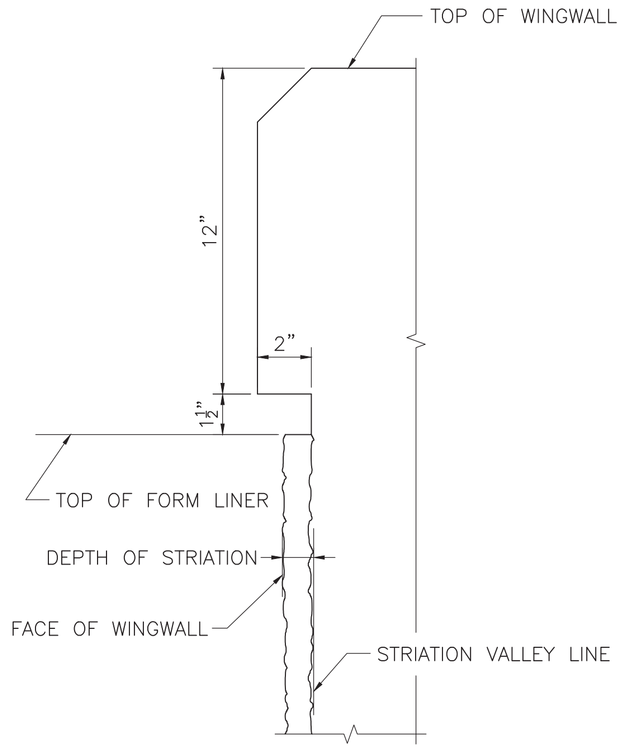
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STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	195	314
PROJECT FILE NO.	608491		

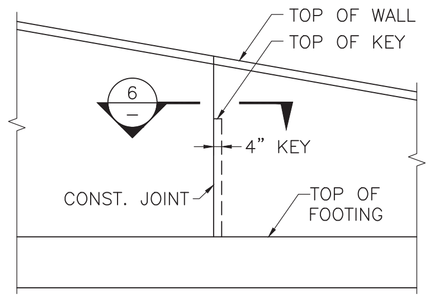
CULVERT RETAINING WALL DETAILS



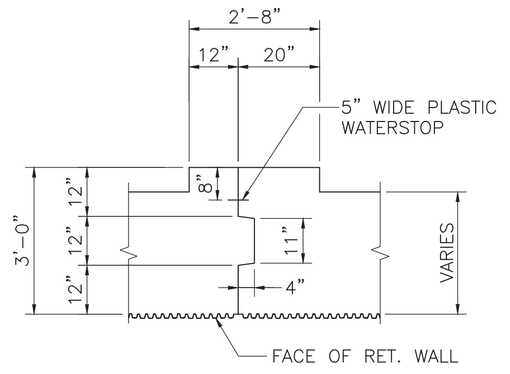
CULVERT RETAINING WALL SECTION
SCALE 3/8" = 1'-0"



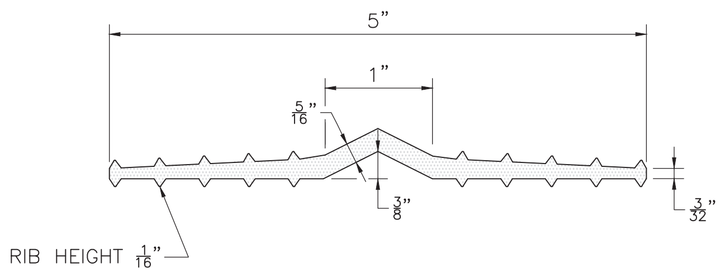
DETAIL AT TOP OF WINGWALL
SCALE: 3" = 1'-0"



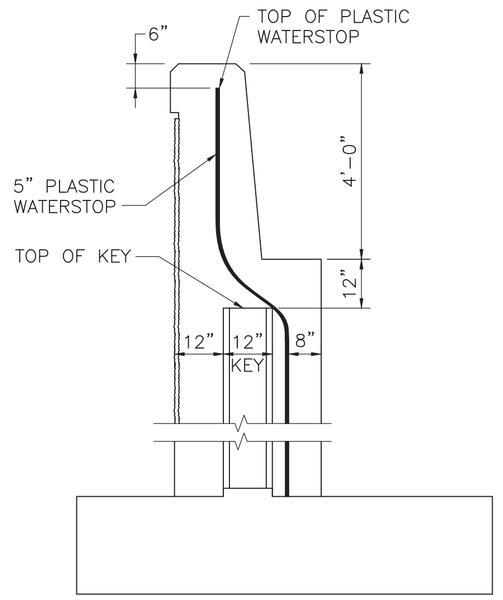
WALL ELEVATION AT CONSTRUCTION JOINT
N.T.S.



SECTION 6
N.T.S.



5" WATERSTOP
N.T.S.



NOTE:
REINFORCEMENT SHALL BE CONTINUOUS THROUGH CONSTRUCTION JOINTS.

VERTICAL SECTION THROUGH CONSTRUCTION JOINT
N.T.S.

RETAINING WALL TYPICAL SECTION

1. 4"ø WEEP HOLES AT 10'-0" MAX. O.C. LOCATED 12" ABOVE THE HEEL OF FOOTING SLOPING 1" PER FOOT TOWARDS FRONT FACE. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
2. RETAINING WALL GEOMETRY AND REINFORCEMENT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO ORDERING MATERIALS OR STARTING WORK.
3. ALL CONCRETE SHALL BE 4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE.

RETAINING WALL DESIGN PARAMETERS

1. BACKFILL AND LOADING CONDITIONS:

   LEVEL BACKFILL
   279 PSF LIVE LOAD SURCHARGE

2. BACKFILL SOIL PROPERTIES

   ϕ = ANGLE OF INTERNAL FRICTION = 32°
   δ = ANGLE OF WALL FRICTION = 21°
   γ = EFFECTIVE UNIT WIGHT = 130 PCF

3. FOUNDATION SOIL PROPERTIES:

   FACTORED BEARING RESISTANCE = 15.0 KSF
   COEFFICIENT OF FRICTION = 0.50
   RESISTANCE FACTOR FOR SLIDING = 0.8

4. REINFORCED CONCRETE:

   f'c = 4,000 PSI
   Fy = 60,000 PSI

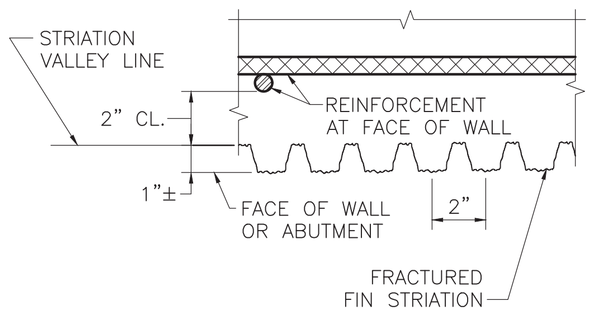
Proposal No. 608491-131468

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MA	-	196	314
PROJECT FILE NO.	608491		

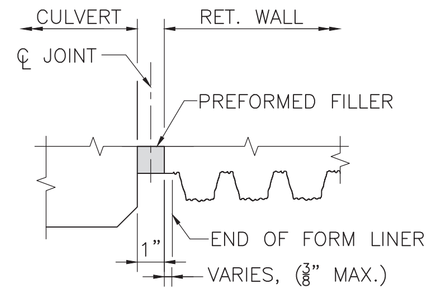
CULVERT MISCELLANEOUS DETAILS



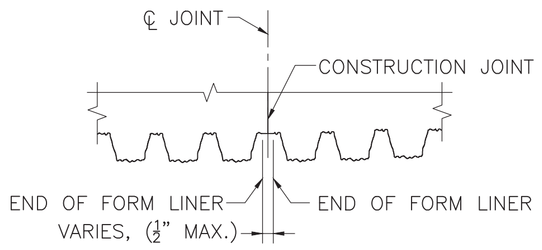
NOTES:

1. THE CONTRACTOR SHALL MAKE SURE THAT THE STRIATION FINS ARE PLUMB AND LINED UP VERTICALLY FROM PANEL TO PANEL FOR THE FULL HEIGHT OF THE WALL.
2. THE HORIZONTAL JOINT MAY BE OMITTED IF THE CONTRACTOR CAN DEMONSTRATE THAT THE FORM LINER PANELS CAN BE INSTALLED END TO END WITHOUT CREATING A VISIBLE SEAM IN THE FINAL CAST CONCRETE.

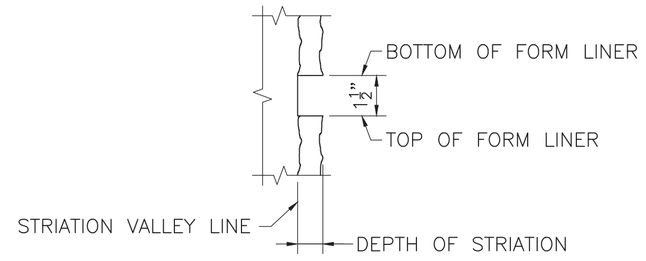
TYPICAL STRIATION DETAIL
SCALE: 3" = 1'-0"



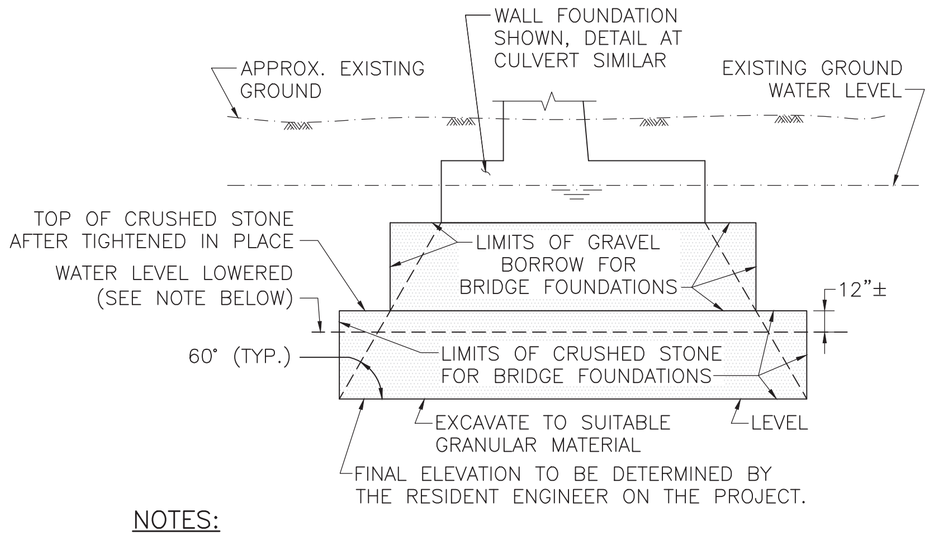
EXPANSION JOINT
SCALE: 3" = 1'-0"



CONSTRUCTION JOINT
SCALE: 3" = 1'-0"



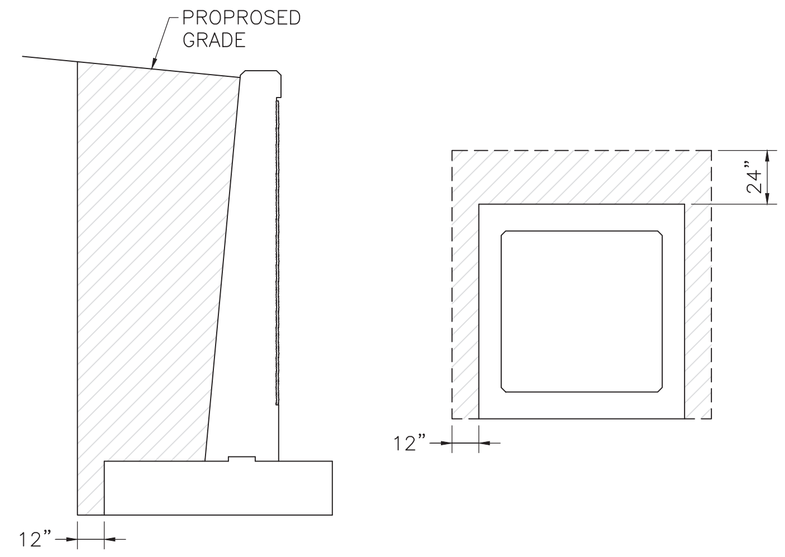
HORIZONTAL PANEL JOINT
SCALE: 3" = 1'-0"



NOTES:

1. LOWER WATER LEVEL AS MUCH AS POSSIBLE WITHOUT DISTURBING THE GRANULAR SOIL (SIDES AND BOTTOM) AND TIGHTEN THE CRUSHED STONE IN PLACE (SEE STANDARD SPECIFICATIONS).
2. REPLACE SOILS ABOVE ELEVATION 253.3 FEET BELOW PROPOSED CULVERT AND CULVERT RETAINING WALL FOUNDATIONS WITH CRUSHED STONE AND OR GRAVEL BORROW AS SHOWN AND PER SPECIFICATIONS.

LIMITS OF CRUSHED STONE AND GRAVEL BORROW FOR WALL AND CULVERT FOUNDATIONS
N.T.S.



RETAINING WALL CULVERT EXTENSION

LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES
N.T.S.

Proposal No. 608491-1314608

A00830 - 395

Appendix B

FEMA Flood Data

National Flood Hazard Layer FIRMette

FEMA

71°33'17"W 42°6'57"N



71°32'40"W 42°6'30"N

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

1:6,000

Proposal No. 608491-131468

A00830 - 397

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
- 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 8/7/2020 at 9:41 AM 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.

National Flood Hazard Layer FIRMette

FEMA

71°33'17"W 42°6'57"N



71°32'40"W 42°6'30"N

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

1:6,000

Proposal No. 608491-131468

A00830 - 398

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

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- 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

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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.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	210	55	324	2.3	204.6	199.8 [2]	200.7	0.9
B	325	35	146	5.1	204.6	201.2 [2]	201.4	0.2
C	2,075	90	406	1.8	204.6	203.8	204.7	0.9
D	4,318	*	292	2.5	205.7	205.7	206.3	0.6
E	4,482	*	175	4.2	209.8	209.8	209.8	0.0
F	6,590	45	220	2.4	211.8	211.8	212.8	1.0
G	6,770	*	265	2.0	221.9	221.9	221.9	0.0
H	8,185	60	311	1.7	221.9	221.9	222.4	0.5
I	10,055	147	321	1.6	223.4	223.4	224.1	0.7
J	11,365	50	171	2.7	226.2	226.2	227.1	0.9
K	11,590	70	163	2.8	227.4	227.4	228.1	0.7
L	13,270	*	88	5.2	234.5	234.5	234.8	0.3
M	13,411	70	330	1.4	237.9	237.9	238.0	0.1
N	14,446	30	54	6.1	238.8	238.8	239.1	0.3
O	15,243	35	110	3.0	246.4	246.4	247.0	0.6
P	16,196	42	120	2.8	250.8	250.8	251.4	0.6
Q	16,771	25	51	6.5	261.0	261.0	261.3	0.3
R	17,196	*	76	4.3	269.0	269.0	269.6	0.6
S	18,231	37	59	5.6	279.1	279.1	279.8	0.7

[1] FEET ABOVE CONFLUENCE WITH MILL RIVER

[2] ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM MILL RIVER

* FLOODWAY COINCIDENT WITH CHANNEL BANKS

TABLE 12

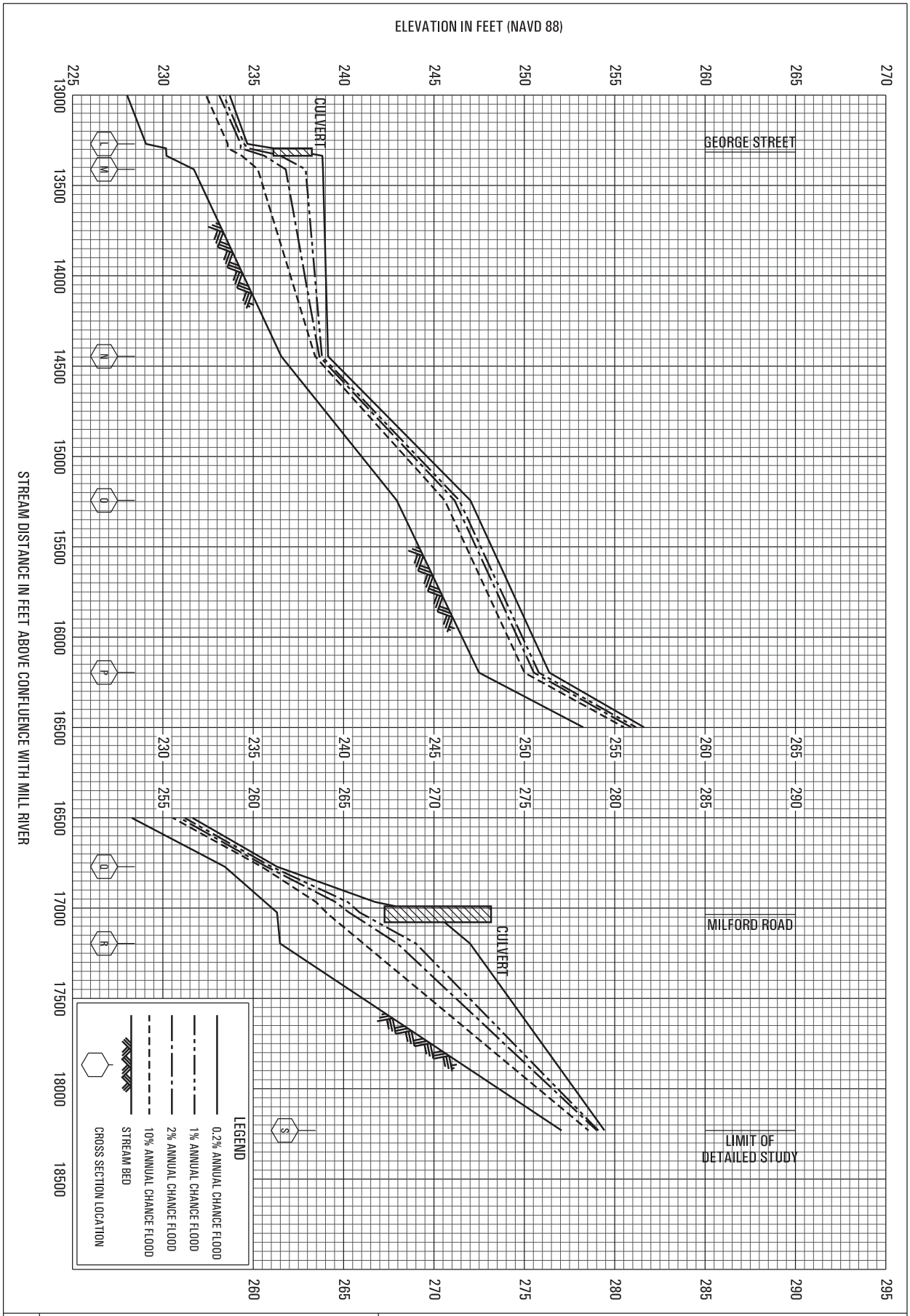
FEDERAL EMERGENCY MANAGEMENT AGENCY

WORCESTER COUNTY, MA
(ALL JURISDICTIONS)

FLOODWAY DATA

MUDDY BROOK

Proposal No. 608491-131468



213P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WORCESTER COUNTY, MA

(ALL JURISDICTIONS)

FLOOD PROFILES

MUDDY BROOK

DOCUMENT A00831

ARMY CORPS OF ENGINEERS

GENERAL PERMIT

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Regulatory Division
Transportation & Utility Section
File Number: NAE-2024-03024

Erica Larner
MassDOT – Highway Division
10 Park Plaza
Boston, Massachusetts 02116
Via Email: erica.n.larner@dot.state.ma.us

Dear Ms. Larner:

This letter is in response to the application you submitted to the U.S. Army Corps of Engineers (USACE), New England District, on December 19, 2024, for a Department of the Army general permit verification to make improvements to Route 16 (Uxbridge Road), including extending an existing culvert conveying an unnamed intermittent stream under Route 16 and replacing the downstream headwall of the culvert conveying Muddy Brook under Route 16 in Mendon, Massachusetts (42.1033 °N, -71.5622 °W). We have assigned this project file number NAE-2024-03024, which you should reference in all correspondence with this office.

The project includes the permanent discharge of fill material within 73 square feet below the Ordinary Water Mark (OHWM) of an unnamed intermittent stream associated with roadway reconstruction and the proposed extension of an existing culvert conveying an unnamed intermittent stream under Route 16. The work also includes temporary discharge of fill within 842 square feet below the OHWM of the unnamed intermittent stream and Muddy Brook associated with dewatering and installation of erosion controls to facilitate culvert extension and headwall repair work. The work is shown on the enclosed plans titled “MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION PLAN AND PROFILE OF IMPROVEMENTS OF UXBRIDGE ROAD, HASTINGS STREET, MILFORD STREET (ROUTE 16) IN THE TOWN OF MENDON WORCESTER COUNTY USACE PCN PLANS,” on 20 sheets dated August 23, 2024.

Based on the information you have provided, we verify that the activity is authorized under General Permit 23 (Linear Transportation and Wetland/Stream Crossings) of the June 2, 2023, federal permit known as the Massachusetts General Permits (GPs). If the extent of the project area and/or nature of the authorized impacts to waters are modified, a revised application must be submitted to this office for written approval before work is initiated. You can find a copy of these permits at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/.

Any deviation from the terms and conditions of the permit, or your submitted plans, may subject the permittee to the enforcement provisions of our regulations. Therefore, in the event changes to this project are contemplated, it is recommended you coordinate with this office prior to proceeding with the work. This office must approve any changes before you undertake them. You must perform this work in compliance with the terms and conditions of the GPs listed above and the following special conditions:

Project Specific Special Conditions:

1. The permittee shall complete and return the enclosed Work-Start Notification Form to this office at least two weeks prior to the anticipated construction start date.

2. The permittee shall complete and return the enclosed Completion Certification Form to this office at least one month following the completion of the authorized work.

3. All construction shall be completed in accordance with the limits of construction and construction sequences detailed on the enclosed plans titled "MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION PLAN AND PROFILE OF IMPROVEMENTS OF UXBRIDGE ROAD, HASTINGS STREET, MILFORD STREET (ROUTE 16) IN THE TOWN OF MENDON WORCESTER COUNTY USACE PCN PLANS," on 20 sheets dated August 23, 2024. If there are changes to the plans or construction methods for work within or adjacent to waters of the U.S., the permittee shall contact USACE to discuss modification of this authorization. USACE must approve any changes before they are undertaken.

This verification is valid until June 1, 2028. You must commence or be under contract to commence the work authorized herein by June 1, 2028, and complete the work by June 1, 2029. If not, you must contact this office to determine the need for further authorization before beginning or continuing the activity. It is recommended that you contact this office before this authorization expires to discuss if permit reissuance is a possibility.

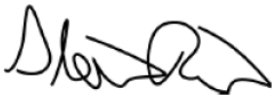
This general permit verification and any associated authorizations does not preclude the necessity to obtain any other federal, state, or local permits, licenses, and/or certifications, which may be required.

Any deviation from the terms and conditions of the If you have any questions related to this verification or have issues accessing documents referenced in this letter, please

contact Kevin Newton, at (978)-318-8044, or by email at kevin.m.newton@usace.army.mil.

This agency continually strives to improve our customer service. To better serve you, please complete the Customer Service Survey located at: https://regulatory.ops.usace.army.mil/customer-service-survey/.

Sincerely,



Stephen Rochette
Acting Chief, Technical Support Branch
Regulatory Division

Enclosures

cc (w/enclosures):
Ed Reiner, U.S. EPA, Region 1 (via reiner.ed@epa.gov)
Taelise Ricketts, FEMA (via Taelise.ricketts@fema.dhs.gov)
Heidi Davis, MassDEP (via heidi.davis@mass.gov)
Tyler Lewis, MassDEP (via tyler.lewis@mass.gov)
Ryan Hale, MassDEP (via ryan.hale@mass.gov)
Kevin Thompson, MassDOT (via kevin.s.thompson@dot.state.ma.us)
Marissa Seifert. (via mseifert@hntb.com)

Work-Start Notification Form

File Number: NAE-2024-03024 State: Massachusetts County: Worcester

Permittee: MassDOT – Highway Division, Erica Larner
Date Verification Issued: 3/28/2025
Project Manager: Kevin Newton

At least two weeks prior to commencing the activity authorized by this permit, sign this certification and return it to the following address:

US ARMY CORPS OF ENGINEERS
New England District
Attn: Kevin Newton
696 Virginia Road
Concord , MA 01742
or
kevin.m.newton@usace.army.mil and cenae-r-ma@usace.army.mil
(978)-318-8044

Please note that your permitted activity is subject to a compliance inspection by a U. S. Army Corps of Engineers (USACE) representative. Failure to comply with any terms or conditions of this authorization may result in the USACE suspending, modifying or revoking the authorization and/or issuing a Class I administrative penalty, or initiating other appropriate legal action.

The people (e.g. contractor) listed below will do the work, and they understand the permit's conditions and limitations.

Contractor Name/Contractor Firm: _____
Business Address: _____
_____
Contractor Phone and Email: _____

Proposed Construction Dates: Start: _____ Finish: _____

_____ _____
Signature of Permittee Date

U.S. Army Corps of Engineers (USACE)

CERTIFICATION OF COMPLIANCE WITH DEPARTMENT OF THE ARMY PERMIT

For use of this form, see Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act of 1899, and Section 103 of the Marine Protection, Research, and Sanctuaries Act; the proponent agency is CECW-COR.

Form Approved - OMB No. 0710-0003 Expires 2027-10-31

The Agency Disclosure Notice (ADN)

The Public reporting burden for this collection of information, 0710-0003, is estimated to average 10 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 burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PURPOSE: This form is used by recipients of U.S. Army Corps of Engineer Regulatory permits to certify compliance with the permit terms and conditions.

Your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with this permit, you are subject to permit suspension, modification, or revocation.

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the U.S. Army Corps of Engineers, New England District, Regulatory Office.

The certification can be submitted by email at kevin.m.newton and cenae-r-ma @usace.army.mil or by mail at the below address:

U.S. Army Corps of Engineers
New England District Office
Street Address: 696 Virginia Road
City: Concord State: Massachusetts Zip Code: New England District Office

COMPLETED BY THE CORPS

Corps Action Number: NAE-2024-03024

Permit Type: General Permit

General Permit Number and Name (*if applicable*):

Name of Permittee: Erica Larner

Project Name: MassDOT / Mendon Route 16

Project Location (*physical address*): 42.1033 °N, -71.5622 °W, Route 16
Mendon, Massachusetts

PERMITTEE'S CERTIFICATION

Date Work Started:

Date Work Completed:

Enclose photographs showing the completed project (*if available*).

I _____ hereby certify that the work authorized by the above referenced permit has been completed in accordance with all of the permit terms and conditions, and that any required compensatory mitigation has been completed in accordance with the permit conditions.

ENG FORM 6285, DEC 2024 PREVIOUS EDITIONS ARE OBSOLETE.

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	20
PROJECT FILE NO.	608491		

TITLE SHEET & INDEX

PLAN AND PROFILE OF

UXBRIDGE ROAD, HASTINGS STREET, MILFORD STREET (ROUTE 16)

IN THE TOWN OF

MENDON

WORCESTER COUNTY

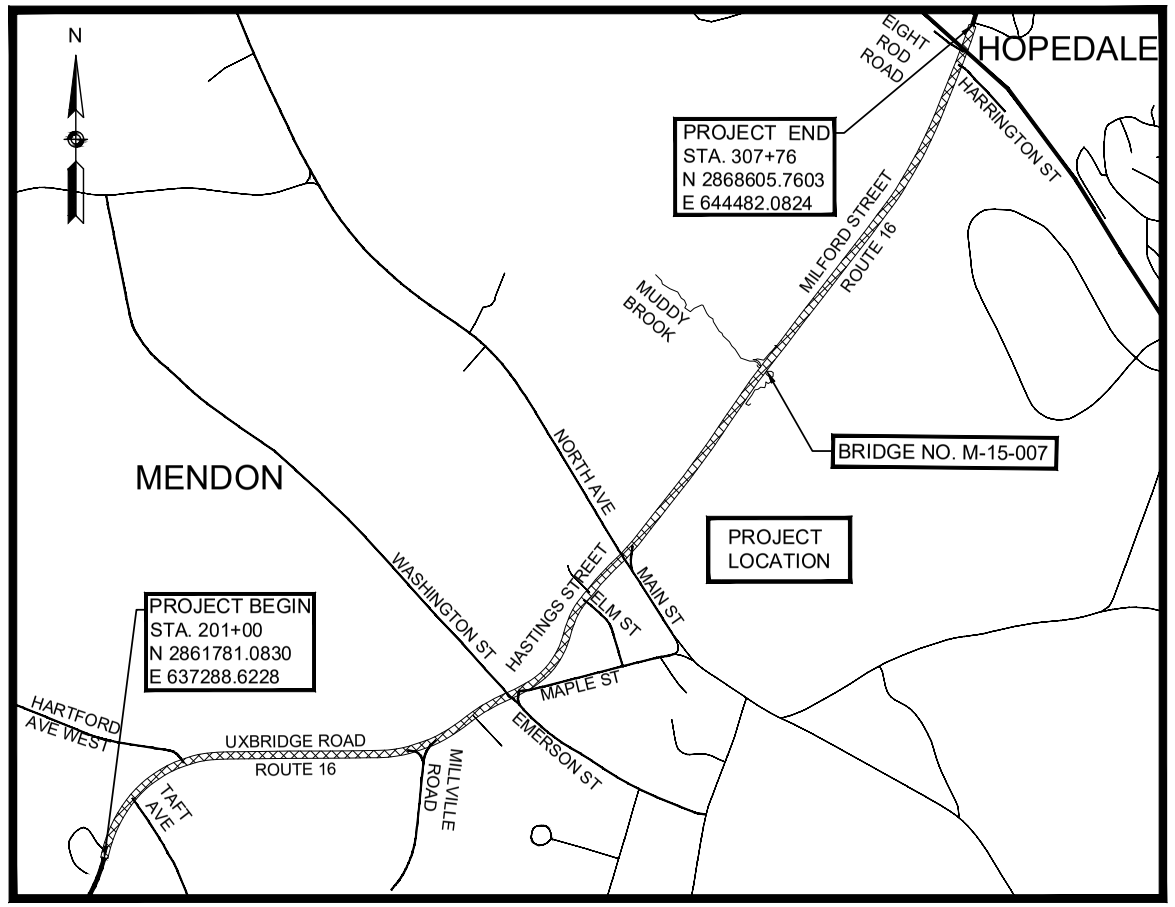
FEDERAL AID PROJECT NO.

USACE PCN PLANS

THESE PLANS ARE SUPPLEMENTED BY THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK.

INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET & INDEX
2	LEGEND & ABBREVIATIONS
3	GENERAL NOTES
4	KEY PLAN
5 - 25	CONSTRUCTION PLANS
26 - 28	CULVERT FLOOD SECTIONS
29 - 33	CULVERT PLANS
34	CONTROL OF WATER PLAN
35 - 38	CONSTRUCTION DETAILS



0 800 1600 2400 3200

SCALE: 1" = 800'

LENGTH OF PROJECT = 10,676.00 FEET = 2.022 MILES

DESIGN DESIGNATION (ROUTE 16)

DESIGN SPEED	STATION
45 MPH	STA. 201+00 TO STA. 239+00
40 MPH	STA. 239+00 TO STA. 261+00
50 MPH	STA. 261+00 TO STA. 301+00
45 MPH	STA. 301+00 TO STA. 307+75
ADT (2019)	18,300
ADT (2031)	19,300
K	8.0%
D	75.0% EB
T (PEAK HOUR)	3.2%
T (AVERAGE DAY)	2.9%
DHV	1,534
DDHV	1,145 EB
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL

DATE	DESCRIPTION	REV #
08/23/24	PS&E DESIGN SUBMISSION	0
02/23/24	100% DESIGN SUBMISSION	0
03/17/23	75% DESIGN SUBMISSION	0
07/30/21	25% DESIGN SUBMISSION	0

massDOT Massachusetts Department of Transportation Highway Division

HNTB
31 ST. JAMES AVE SUITE 300
BOSTON, MA 02116

APPROVED

CHIEF ENGINEER **DATE**

Proposal No. 608491-131468

A00831 - 8

608491_EV1(TITLE & INDEX).DWG Plotted on 6-Feb-2025 8:29 PM

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
CO. BD.		HYDRANT
		LIGHT POLE
		COUNTY BOUND
		GPS POINT
C	C	CABLE MANHOLE
D	D	DRAINAGE MANHOLE
E	E	ELECTRIC MANHOLE
G	G	GAS MANHOLE
M	M	MISC MANHOLE
S	S	SEWER MANHOLE
T	T	TELEPHONE MANHOLE
MON	W	WATER MANHOLE
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
TB		MONUMENT
		STONE BOUND
		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UPL	UPL	UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		TREE PROTECTION
PM	PM	SWAMP / MARSH
WG	WG	WATER GATE
		PARKING METER
100 99		OVERHEAD CABLE/WIRE
100 99		CURBING
		CONTOURS (ON-THE-GROUND SURVEY DATA)
		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
x	x	CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT CONTROL BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		ORDINARY HIGH WATER LINE
		BORDER OF WETLAND
		LIMIT OF 100 YEAR FLOODPLAIN
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING (REM)	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR
		VIDEO DETECTION ZONE
		VIDEO DETECTION CAMERA
		PEDESTRIAN PUSH BUTTON, SIGN, AND SADDLE
		EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		PEDESTRIAN SIGNAL HEAD
		SIGNAL POST AND BASE
		MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		SPAN POLE
		SIGN AND POST
		SIGN AND POST (2 POSTS)
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE (12"/24" WIDE)
	CW	CROSSWALK (12" WIDE)
	SWL	SOLID WHITE LINE (6" WIDE)
	SYL	SOLID YELLOW LINE (6" WIDE)
	BWL	BROKEN WHITE LINE (6" WIDE)
	BYL	BROKEN YELLOW LINE (6" WIDE)
	DWL	DOTTED WHITE LINE (6" WIDE, 3' LINE SEGMENT, 9' BREAKS)
	DYL	DOTTED YELLOW LINE (6" WIDE, 3' LINE SEGMENT, 9' BREAKS)
	DWLEx	DOTTED WHITE LINE EXTENSION (6" WIDE, 2' LINE SEGMENT, 6' BREAKS)
	DYLEx	DOTTED YELLOW LINE EXTENSION (6" WIDE, 2' LINE SEGMENT, 6' BREAKS)
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE
	YL	YIELD LINE
		BIKE LANE MARKING
		BIKE DETECTOR MARKING
		SHARED USE LANE MARKING
		1-WAY WHITE SLOTTED PAVEMENT MARKER
		2-WAY YELLOW/YELLOW SLOTTED PAVEMENT MARKER
		1-WAY YELLOW SLOTTED PAVEMENT MARKER

ALL PAVEMENT MARKINGS SHALL BE RECESSED POLYUREA UNLESS OTHERWISE SPECIFIED.

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ECCEN	ECCENTRIC
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
ER	EASTERN REDBUD
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
JCT	JUNCTION
L	LENGTH OF CURVE
LSA	LANDSCAPE AREA
LB	LEACH BASIN
LD	LONDON PLANETREE
LP	LIGHT POLE
LT	LEFT
LST	LOW SEATED TIMBER
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
NTS	NOT TO SCALE
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PCR	PEDESTRIAN CURB RAMP
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	20
PROJECT FILE NO.	608491		

LEGEND & ABBREVIATIONS

ABBREVIATIONS (cont.)

GENERAL

POT	POINT ON TANGENT
PRC	POINT ON REVERSE CURVE
PROJ	PROJECT
PROP	PROPOSED
PSB	PORTABLE SOIL BORROW
PT	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PVMT	PAVEMENT
PWW	PAVED WATERWAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SUP	SHARED USE PATH
SW	SIDEWALK
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TP	TREE PROTECTION
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

TRAFFIC SIGNAL ABBREVIATIONS

CAB	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY UPRAISED HAND
FDW	FLASHING UPRAISED HAND
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR YELLOW
FYL	FLASHING YELLOW LEFT ARROW
FYR	FLASHING YELLOW RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALKING PERSON
Y	STEADY CIRCULAR YELLOW
YL	STEADY YELLOW LEFT ARROW

Proposal No. 608491-131468

608491_EV2(LEGEND & ABBREVIATIONS).DWG Plotted on 6-Feb-2026 8:07 PM

A00831 - 9

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	20
PROJECT FILE NO.	608491		

GENERAL NOTES

GENERAL NOTES

1. THIS BASEMAPPING WAS PREPARED BY NITSCH ENGINEERING IN JULY-SEPTEMBER, 2018, UTILIZING VARIOUS SURVEY EQUIPMENT TO INCLUDE LEICA TPS 1200 TOTAL STATION, LEICA GS14 GPS AND TERRESTRIAL MOBILE LIDAR. FIELD UPDATES AND ADDITIONAL TOPOGRAHIC DATA WAS COLLECTED IN OCTOBER 2020.
2. WETLANDS WERE DELINEATED BY HNTB IN ACCORDANCE WITH THE 1987 UNITED STATES ARMY CORPS OF ENGINEERS WETLAND DELINEATION MANUAL BETWEEN AUGUST 7, 2020 AND OCTOBER 1, 2020. AND VERIFIED ON OCTOBER 4, 2023. WETLAND FLAGS WERE LOCATED BY HNTB UTILIZING EOS ARROW 100 GNSS GPS UNIT WITH SUBMETER ACCURACY.
3. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXISTING GRADES AND ELEVATIONS. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY GRADE DISCREPANCIES PRIOR TO CONSTRUCTION.
4. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION.
5. PEDESTRIAN AND VEHICLE ACCESS TO ABUTTING PREMISES WILL BE MAINTAINED AT ALL TIMES AS DIRECTED BY THE ENGINEER. EMERGENCY VEHICLE ACCESS SHALL BE MAINTAINED AT ALL TIMES.
6. CONTRACTOR SHALL BE LIMITED TO CONSTRUCTION ACTIVITIES WITHIN THE IDENTIFIED LIMITS OF WORK AS SHOWN ON THE PLANS, OR AS DIRECTED TO DO SO BY THE ENGINEER.
7. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FROM THE TOWN AND APPLICABLE AGENCIES PRIOR TO COMMENCING WORK.
8. CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITY SERVICES AND HIGHWAY LIGHTING THROUGHOUT CONSTRUCTION UNTIL AND UNLESS THEY ARE REPLACED PER THE CONTRACT.
9. ALL GRANITE CURB THAT IS REMOVED SHALL BE RESET OR DISCARDED AS REQUIRED BY THE ENGINEER. GRANITE CURB THAT IS TO BE RESET SHALL NOT BE RANDOMLY MIXED WITH NEW CURB, BUT SHALL BE RESET SO AS TO GIVE A UNIFORM APPEARANCE.
10. DEWATERING IS LIKELY TO BE REQUIRED AT THE MUDDY BROOK CULVERT EXTENSIONS AND WORK ON THE DRAINAGE IMPROVEMENTS. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EXTENT OF DEWATERING REQUIRED AND TO PROPOSE THE MOST APPROPRIATE METHODS AND MATERIALS FOR DEWATERING THAT WILL ULTIMATELY BE APPROVED BY THE MASSDOT PROJECT ENGINEER. PLANS AND CALCULATIONS FOR ALL WATER CONTROL MEASURES WILL BE DEVELOPED BY THE CONTRACTOR, STAMPED BY A PROFESSIONAL CIVIL ENGINEER REGISTERED IN THE COMMONWEALTH, AND SUBMITTED TO MASSDOT'S PROJECT ENGINEER FOR APPROVAL PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
11. ALL DEWATERING AND/OR PUMP-AROUND RELATED EARTHWORK WILL BE CONDUCTED IN SUCH A MANNER AS TO PREVENT POTENTIAL SILTATION AND CONTAMINATION OF THE WETLANDS AND WATERWAYS WITHIN THE PROJECT LIMITS. ANY PUMPING DISCHARGE WILL NOT BE ALLOWED TO ENTER DIRECTLY INTO STREAMS OR ADJACENT WETLAND RESOURCE AREAS. WATER FROM THE WORK AREA WILL BE PUMPED TO A SEDIMENT FILTER BAG, WHICH WILL BE PLACED IN AN UPLAND AREA AND ENCIRCLED WITH COMPOST FILTER TUBES OR STRAW WATTLES. DEWATERING WILL BE CAREFULLY MONITORED TO ENSURE THAT THE WATER IS NOT PUMPED FASTER THAN IT CAN BE TREATED AND WILL BE TIMED TO AVOID PERIODS OF HIGH FLOW. ALL FILTERED SEDIMENTS WILL BE REMOVED FROM THE PROJECT AREA AND DISPOSED OFF-SITE. ONCE ALL CONSTRUCTION IN DEWATERED AREAS IS COMPLETE, THE ENTIRE WATER CONTROL SYSTEM STRUCTURE WILL BE REMOVED FROM THE SITE.
12. CONTRACTOR TO REMOVE AND STACK EXIST TOWN OF MENDON BANNERS ON UTILITY POLES. CONTRACTOR TO LEAVE ALL BANNERS AND BRACKETS AT THE TOWN HIGHWAY DEPARTMENT, ADDRESS 66 PROVIDENCE ST. MENDON, MA. 01756

DRAINAGE NOTES

1. CONTRACTOR SHALL VERIFY THE LOCATION OF THE EXISTING DRAINAGE SYSTEMS THAT ARE SHOWN ON THE DRAINAGE PLANS. WHERE EXISTING DRAINAGE IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION, AND SIZE SHALL BE ACCURATELY DETERMINED AND THE CONTRACTOR SHALL CONFIRM WHETHER THE DRAINAGE SYSTEM IS STILL ACTIVE. THE INFORMATION SHALL BE FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT. ALL ACTIVE DRAINAGE SYSTEMS IN CONFLICT WITH THE PROPOSED WORK SHALL BE RELOCATED IN KIND IN SUCH A MANNER AS TO AVOID IMPACTS TO PROPOSED ITEMS AND UTILITIES AS WELL AS IMPACTS TO EXISTING ITEMS AND UTILITIES TO REMAIN. IF DRAINAGE SYSTEM IS FOUND TO BE INACTIVE IT SHALL BE REMOVED OR FILLED IN-PLACE PER THE APPROVAL OF THE ENGINEER.
2. NO EXISTING DRAINAGE SYSTEMS SHALL BE ABANDONED, PLUGGED OR REMOVED WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.
3. PRECAST DRAINAGE STRUCTURES SHALL COMPLY WITH ASTM C-478 (CIRCULAR MANHOLES AND CATCH BASINS) AND ASTM C-913 (RECTANGULAR MANHOLES AND CATCH BASINS) AND ALL APPLICABLE ASSOCIATED ASTM STANDARDS.
4. PRECAST CONCRETE RINGS OR NON-SHRINK GROUT SHALL BE USED FOR GRADE ADJUSTMENTS.
5. CONTRACTOR SHALL CLEAN AND MAKE FUNCTIONAL ALL EXISTING STRUCTURES AND PIPING WITHIN THE LIMIT OF WORK. ALL EXISTING AND/OR PROPOSED DRAINAGE STRUCTURES AND PIPES WITHIN THE LIMIT OF WORK SHALL AGAIN BE CLEANED PRIOR TO CONCLUSION OF THE CONTRACT.
6, SHOULD DAMAGE OF ANY KIND OCCUR TO EXISTING PIPES AND STRUCTURES, THE CONTRACTOR SHALL MAKE REPAIRS, AT HIS OR HER OWN EXPENSE, TO THE SATISFACTION OF THE ENGINEER AND UTILITY OWNER.
7. GRADING SHALL PROVIDE POSITIVE DRAINAGE TO ALL DRAIN INLET STRUCTURES.
8. DURING CONSTRUCTION, ALL STRUCTURES OF THE EXISTING SYSTEM AND NEW SYSTEM OF DRAINS SHALL BE PROTECTED AGAINST SEDIMENTATION AND DEBRIS.
9. ALL DRAINAGE STRUCTURES AND PIPING SHALL BE DESIGNED AND CONSTRUCTED TO WITHSTAND REQUIRED LOADING, AS SHOWN IN THE CONTRACT DOCUMENTS.
10. PROPOSED INVERTS ON PLANS ARE SHOWN FOR BIDDING PURPOSES ONLY. ACTUAL INVERT ELEVATIONS WILL BE CONFIRMED IN THE FIELD.
11. DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY, BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES THE ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY STRUCTURES BE ORDERED. ANY FIELD ADJUSTMENTS TO LINE & GRADE UP TO A DEPTH OF 5' SHALL BE INCLUDED IN THE COST OF THE PIPE. PIPE EXCAVATION GREATER THAN 5' WILL BE PAID UNDER CLASS B TRENCH EXCAVATION.

UTILITY NOTES

1. ALL UNDERGROUND UTILITIES AS SHOWN WERE COMPILED USING FIELD SURVEY INFORMATION AND AVAILABLE RECORD INFORMATION.
2. RECORD UTILITY INFORMATION FROM THE VARIOUS UTILITY COMPANIES AND PUBLIC AGENCIES, ARE APPROXIMATE ONLY AND ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD.
3. ALL UTILITY COMPANIES, PUBLIC AND PRIVATE MUST BE NOTIFIED, INCLUDING THOSE IN CONTROL OF UTILITIES NOT SHOWN ON THIS PLAN, (SEE CHAPTER 370, ACTS OF 1963, MASSACHUSETTS) PRIOR TO DESIGNING, EXCAVATING, BLASTING, INSTALLING, BACKFILLING, GRADING, PAVEMENT RESTORING OR REPAVING.
4. THE LOCATION OF EXISTING PIPES OR OTHER UNDERGROUND STRUCTURES OR PROPERTY LINES ARE NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL UNDERGROUND PIPES OR STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL CALL "DIG SAFE" (1-888-344-7233) 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS) PRIOR TO ANY EXCAVATION TO OBTAIN ACCURATE UTILITY LOCATIONS.
5. SUBSURFACE UTILITY LOCATIONS HAVE BEEN PLOTTED TO MEET UTILITY QUALITY LEVEL "C" AS DESCRIBED IN ASCE STANDARD 38-02 AND SUMMARIZED HERE. THE UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS BASED ON ABOVE-GROUND FIELD OBSERVATION AND EXISTING RECORD INFORMATION RECEIVED FROM UTILITY STAKE-HOLDERS.
6. IN ACCORDANCE WITH MGL CHAPTER 82, SECTION 40, 40A-40E INCLUDING AMENDMENTS, THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES, TOWN OF MENDON AND HOPEDALE, AND GOVERNMENT AGENCIES INCLUDED IN THIS PROJECT IN WRITING PRIOR TO ANY EXCAVATION WORK. CALL "DIG SAFE" AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK.
7. INVERTS SHOWN ON PLAN ARE NOT GUARANTEED TO BE ACCURATE. DUE TO THE LIMITATIONS OF FIELD OBSERVATION AND SURVEY TECHNIQUES THE INVERTS ARE SHOWN AS APPROXIMATE ONLY AND SHALL NOT BE WARRANTED TO BE CORRECT. ADDITIONAL FIELD INVESTIGATION IS NECESSARY WHERE ACCURATE MEASUREMENTS ARE REQUIRED FOR DESIGN OF CRITICAL AREAS.
8. THE EXISTING CONDITIONS PLAN IS TO BE USED FOR THE SPECIFIED PROJECT ONLY AND IS NOT WARRANTED TO BE COMPLETE FOR ANY OTHER FUTURE PROJECTS.
9. CONTRACTOR SHALL CONDUCT SUBSURFACE INVESTIGATIONS TO IDENTIFY GROUND WATER ELEVATION PRIOR TO CONSTRUCTION.
10. TREE TRIMMING AND SELECTIVE THINNING SHOULD OCCUR AT ANY NEW UTILITY POLE AND PROVIDE 10' CLEAR WIDTH OF ALL OVERHEAD WIRES (OHW). CONTRACTOR TO CONFIRM CLEARING AND TREE TRIMMING LIMITS TO MINIMIZE TRIMMING TO THE MAXIMUM EXTENT POSSIBLE. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.

SURVEY NOTES

1. THE HORIZONTAL DATUM SHOWN HEREON REFERENCES THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MAINLAND ZONE, NAD83(2011) EPOCH 2010.0 IN US SURVEY FOOT.
2. THE VERTICAL DATUM SHOWN HEREON REFERENCES NAVD88, GEOID 12B.
3. GROUND CONTROL PROVIDED BY MASSDOT.
4. ABUTTERS PROPERTY LINES DEPICTED HEREON ARE APPROXIMATE ONLY AND ARE BASED A COMPILATION OF RECORD DEEDS AND PLANS.
5. THE BASE PLAN WAS PREPARED WITHOUT THE BENEFIT OF A TITLE SEARCH AND MAY NOT DISCLOSE ANY MATTERS THAT MAY BE REVEALED BY ONE.
6. THE BASE PLAN DOES NOT SHOW UNWRITTEN OR UNRECORDED EASEMENTS WHICH MAY EXIST. A REASONABLE AND DILIGENT ATTEMPT HAS BEEN MADE TO OBSERVE ANY APPARENT AND VISIBLE USES OF THE LAND. THE BASE PLAN DOES NOT GUARANTEE THAT NO SUCH EASEMENTS EXIST.
7. LEGAL STATUS OF EASEMENTS, WAYS AND RESTRICTIONS NOT DETERMINED BY THE SURVEY.
8. TITLE TO LAND IN THE ABUTTING WAYS IS NOT SHOWN AND HAS NOT BEEN DETERMINED AS A RESULT OF THE SURVEY.
9. THE RIGHT-OF-WAY LINES AND BASELINES SHOWN ON THE BASE PLAN ARE BASED ON STATE HIGHWAY LAYOUTS. THE MONUMENTS FOUND MARKING THE LAYOUT PLAN WERE FIELD LOCATED AND USED TO ESTABLISH THE RIGHT-OF-WAY LINES UTILIZING A BEST FIT SOLUTION.
10. DASHED BUILDING LINES ARE FROM MASSGIS AND ARE SHOWN FOR GRAPHICAL REFERENCE ONLY.

TRAFFIC NOTES

1. THE MINIMUM MOUNTING HEIGHT OF POST-MOUNTED SIGNS, MEASURED VERTICALLY FROM THE BOTTOM OF THE SIGN TO THE TOP OF THE CURB OR SIDEWALK, OR THE ELEVATION OF THE NEAR EDGE OF THE TRAVELED WAY, SHALL BE 7 FEET NEAR SIDEWALK AND 8 FEET NEAR SHARED USE PATH UNLESS OTHERWISE SPECIFIED ON THE PLANS.
2. TRAFFIC SIGNAL CONDUIT SHALL BE 3" SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.

Proposal No. 608491-131468

608491_EV3(GENERAL NOTES).DWG Plotted on 3-Feb-2026 8:48 PM

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	20
PROJECT FILE NO.	608491		

KEY PLAN

PROJECT BEGIN
STA 201+00
N 2861781.0830
E 637288.6228

HARTFORD AVE WEST
ROUTE 16 (UXBRIDGE RD)
WASHINGTON ST
MAPLE ST
ELM ST
MILL VILLE ST
ROUTE 16 (HASTINGS ST)
EMERSON ST
CONTINUED BELOW

NORTH AVE
MAIN ST
ROUTE 16 (MILFORD ST)
MUDDY BROOK
CONTINUED ABOVE
CONTINUED BELOW

PROJECT END
STA 307+76
N 2868605.7603
E 644482.0824

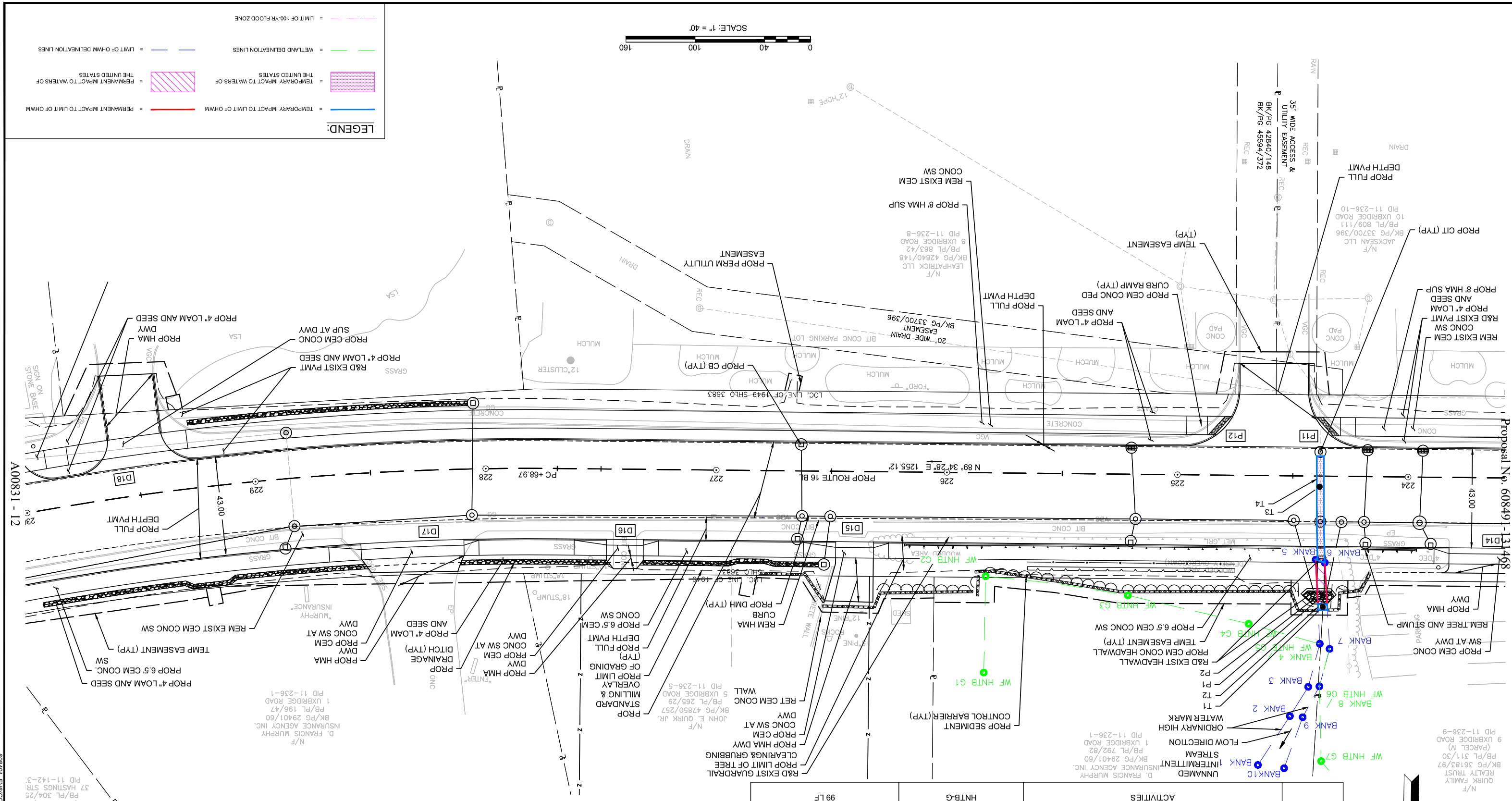
ROUTE 16 (MILFORD ST)
MENDON HOPEDALE
CONTINUED ABOVE

0 150 300 450 600
SCALE: 1" = 150'

Proposal No. 608491-13468

A00831 - 11

608491_EV4(KEY PLAN).DWG Plotted on 3-Feb-2025 8:55 PM


SCALE: 1" = 40'
0
40
100
160
LEGEND:
TEMPORARY IMPACT TO LIMIT OF OHWM
PERMANENT IMPACT TO LIMIT OF OHWM
TEMPORARY IMPACT TO WATERS OF THE UNITED STATES
PERMANENT IMPACT TO WATERS OF THE UNITED STATES
WETLAND DELINEATION LINES
LIMIT OF OHWM DELINEATION LINES
LIMIT OF 100-YR FLOOD ZONE
N
P1
P2
T1
T2
T3
T4
BANK 1
BANK 2
BANK 3
BANK 4
BANK 5
BANK 6
BANK 7
BANK 8
BANK 9
BANK 10
WF HNTB G1
WF HNTB G2
WF HNTB G3
WF HNTB G4
WF HNTB G5
WF HNTB G6
WF HNTB G7
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP FULL DEPTH PVMT
PROP 4" LOAM AND SEED
PROP CEM CONC PED CURB RAMP (TYP)
TEMP EASEMENT (TYP)
PROP CIT (TYP)
PROP FULL DEPTH PVMT
REM EXIST CEM CONC SW
PROP 8" HMA SUP
PROP 20" WIDE DRAIN EASEMENT BK/PG 33700/396
PROP PERM UTILITY EASEMENT
REM EXIST CEM CONC SW
PROP 8" HMA SUP
PROP 4" LOAM AND SEED
R&D EXIST PVMT
PROP CEM CONC SUP AT DWY
PROP HMA DWY
PROP 4" LOAM AND SEED
REM EXIST CEM CONC SW
TEMP EASEMENT (TYP)
PROP 6.5' CEM CONC SW
PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP DRAINAGE DITCH (TYP)
PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP 6.5' CEM CONC SW
PROP FULL DEPTH PVMT (TYP)
PROP LIMIT OF GRADING
PROP STANDARD OVERLAY MILLING & STANDARD
RET CEM CONC WALL
R&D EXIST GUARDRAIL
PROP LIMIT OF TREE CLEARING& GRUBBING
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP CB (TYP)
PROP DMH (TYP)
REM HMA CURB
PROP 6' HMA SUP
PROP 4" LOAM AND SEED
PROP CEM CONC HEADWALL
R&D EXIST HEADWALL
TEMP EASEMENT (TYP)
PROP 6.5' CEM CONC SW
REM HMA DWY
REM.TREE AND STUMP
PROP CEM CONC SW AT DWY
PROP FULL DEPTH PVMT
PROP HMA DWY
REM EXIST CEM CONC SW AND SEED
PROP 8' HMA SUP
PROP 4" LOAM
R&D EXIST PVMT
PROP CEM CONC SW AND SEED
PROP 8' HMA SUP
PROP 4" LOAM AND SEED
PROP 6.5' CEM CONC SW
TEMP EASEMENT (TYP)
PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SUP AT DWY
R&D EXIST PVMT
PROP 4" LOAM AND SEED
PROP FULL DEPTH PVMT
PROP ROUTE 16 BL
N 89° 34'28" E 1255.12'
LOC. LINE OF 1949 SHLO 3683
LOC. LINE OF 1949 SHLO 3683
PC +68.97
35' WIDE ACCESS & UTILITY EASEMENT BK/PG 42840/148 BK/PG 45594/372
20' WIDE DRAIN EASEMENT BK/PG 33700/396
N/F LEAHPATRICK LLC BK/PG 42840/148 PB/PL 863/42 8 UXBRIDGE ROAD PID 11-236-8
N/F JACKSEAN LLC BK/PG 33700/396 PB/PL 809/111 10 UXBRIDGE ROAD PID 11-236-10
N/F OURK FAMILY REALTY TRUST BK/PG 36183/97 PB/PL 311/30 9 UXBRIDGE ROAD (PARCEL IV) PID 11-236-9
N/F D. FRANCIS MURPHY INSURANCE AGENCY INC. BK/PG 29401/60 PB/PL 196/47 1 UXBRIDGE ROAD PID 11-236-1
N/F D. FRANCIS MURPHY INSURANCE AGENCY INC. BK/PG 29401/60 PB/PL 792/82 1 UXBRIDGE ROAD PID 11-236-1
N/F JOHN E. OURK JR. BK/PG 47850/257 PB/PL 265/29 5 UXBRIDGE ROAD PID 11-236-5
N/F HASTINGS STREET PLA BK/PG 59891/1 PB/PL 304/25 37 HASTINGS STR PID 11-142-3
"FORD"
"ENTER"
"MURPHY INSURANCE"
"FORD"
"TUMP"
"STUMP"
"CLUSTER"
"PINE"
"FENCE"
"FENCE"
"FENC

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	20
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 2 OF 3

LEGEND:

- = TEMPORARY IMPACT TO LIMIT OF OHWM
- = PERMANENT IMPACT TO LIMIT OF OHWM
- = TEMPORARY IMPACT TO WATERS OF THE UNITED STATES
- = PERMANENT IMPACT TO WATERS OF THE UNITED STATES
- = WETLAND DELINEATION LINES
- = LIMIT OF OHWM DELINEATION LINES
- = LIMIT OF 100-YR FLOOD ZONE

"MUDDY BROOK NORTH CONSERVATION AREA"
METACOMET LAND TRUST, INC
CONSERVATION RESTRICTION
SUBJECT TO ARTICLE 97
BK/PG 52480/277

N/F
TOWN OF MENDON
(CONSERVATION COMMISSION)
BK/PG 42983/63
20 MILFORD STREET
PID 9-177-20

N/F
RAYMOND G. ZOOK AND JANE M. ZOOK
BK/PG 18858/225
PB/PL 168/131
21 MILFORD STREET
PID 9-177-21

N/F
PURPLE POWER LLC
BK/PG 52123/179
35 MILFORD STREET
PID 9-177-35

MENDON CENTER HISTORIC DISTRICT

MUDDY BROOK

ROUTE 16
(MILFORD STREET)

PROP ROUTE 16 BL

PC +96.35

N 34° 08' 34" E 708.46'

LOC. LINE OF 1949 SHLO 3683

100-YR FLOOD ZONE (EL = 267')

100-YR FLOOD ZONE (EL = 265.5')

ORDINARY HIGH WATER MARK

ORDINARY HIGH WATER MARK

PROP. COFFERDAM

PROP. 3' X 3' WATER PUMP

FLOW

FLOW

PROP FULL DEPTH PVMT WIDENING

PROP FULL DEPTH PVMT WIDENING

PROP STANDARD MILLING AND OVERLAY

R&D EXIST CONC BARRIER

PROP 4" LOAM AND SEED

PROP LIMIT OF GRADING (TYP)

R&D EXIST GUARDRAIL

R&D EXIST GUARDRAIL

SAWCUT (TYP)

PROP SEDIMENT CONTROL BARRIER (TYP)

PROP SEDIMENT CONTROL BARRIER (TYP)

PROP NATIVE SEEDING

TEMP NATIVE SEEDING

PROP 8' HMA SUP

PROP BMP AREA

PROP TEMP EASEMENT

LIMIT OF FLAGGED WETLAND

PROP FES-4 (12" RCP)

PROP CB (TYP)

REM HMA CURB

R&D EXIST GUARDRAIL

PROP LIMIT OF WORK

PROP LIMIT OF WORK

PERMANENT DRAINAGE EASEMENT

TEMP EASEMENT

WF HNTB D9
WF HNTB D8
WF HNTB D7
WF HNTB D6
WF HNTB D5
WF HNTB D4
WF HNTB D3
WF HNTB D2
WF HNTB D1
WF HNTB E5
WF HNTB E4
WF HNTB E3
WF HNTB E2
WF HNTB E1
WF HNTB E6
WF HNTB E7
WF HNTB E8
WF HNTB E9
WF HNTB E10
WF HNTB E11

BANK 1
BANK 2 / WF HNTB C6
BANK 3
BANK 4
BANK 5
BANK 6
BANK 7
BANK 8
BANK 9
BANK 10
BANK 11
BANK 1 / WF HNTB E1

T6
T5

MUDDY BROOK

WOODS
MET GRL
BIT PATCH
BIT SHOULDER
BCB
VGC
RIPRAP
14"

270
271
272
273
274
275
29.00
23.00

NOTE:

1. TEMPORARY IMPACTS TO LIMIT OF OHWM AND WATERS OF THE UNITED STATES WILL OCCUR DUE TO DEWATERING ACTIVITIES. FOR DETAILS ON TEMPORARY IMPACTS DUE TO DEWATERING, PLEASE SEE SHEET 16.
2. EROSION AND SEDIMENT CONTROLS SHALL TIE INTO INSTALLED COFFERDAM AT THE LIMIT OF DEWATERING.

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T5	TEMPORARY IMPACTS TO OHWM DUE TO CULVERT HEADWALL REPAIR WORK	HNTB-D / MUDDY BROOK	163 LF
T6	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO CULVERT HEADWALL REPAIR WORK	HNTB-D / MUDDY BROOK	691 SQ. FT

0 40 100 160
SCALE: 1" = 40'

CONTINUED ON SHEET NO. 7

Proposal No. 608491-13
A00831 - 13
608491_EV6(CONST PLANS-NOI).DWG
Plotted on 20-Feb-2025 2:40 PM

MENDON
ROUTE 16

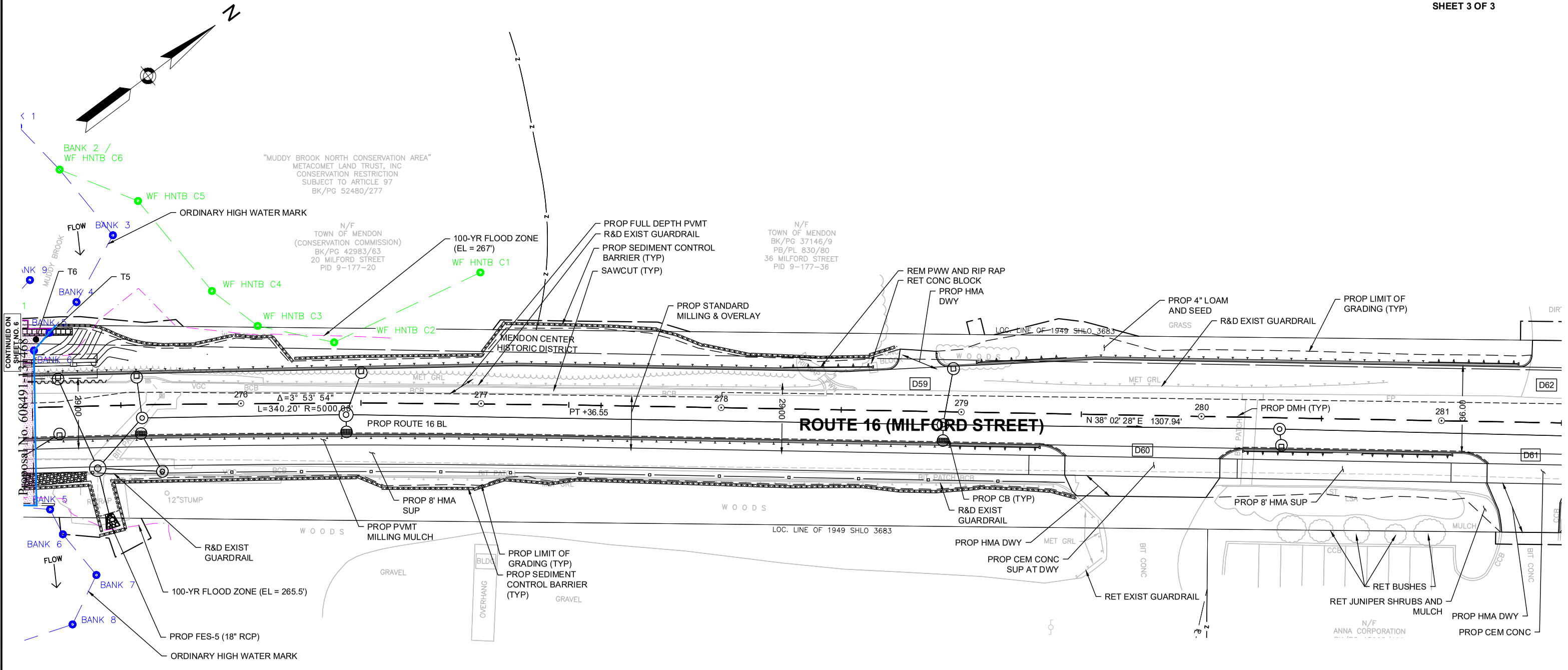
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	20
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 3 OF 3

608491_EV6(CONST PLANS-NOI).DWG Plotted on 20-Feb-2025 2:44 PM

Proposal No. 608491-13HSIP

CONTINUED ON SHEET NO. 6



0 40 100 160

SCALE: 1" = 40'

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T5	TEMPORARY IMPACTS TO OHWM DUE TO CULVERT HEADWALL REPAIR WORK	HNTB-D / MUDDY BROOK	163 LF
T6	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO CULVERT HEADWALL REPAIR WORK	HNTB-D / MUDDY BROOK	691 SQ. FT

NOTE:

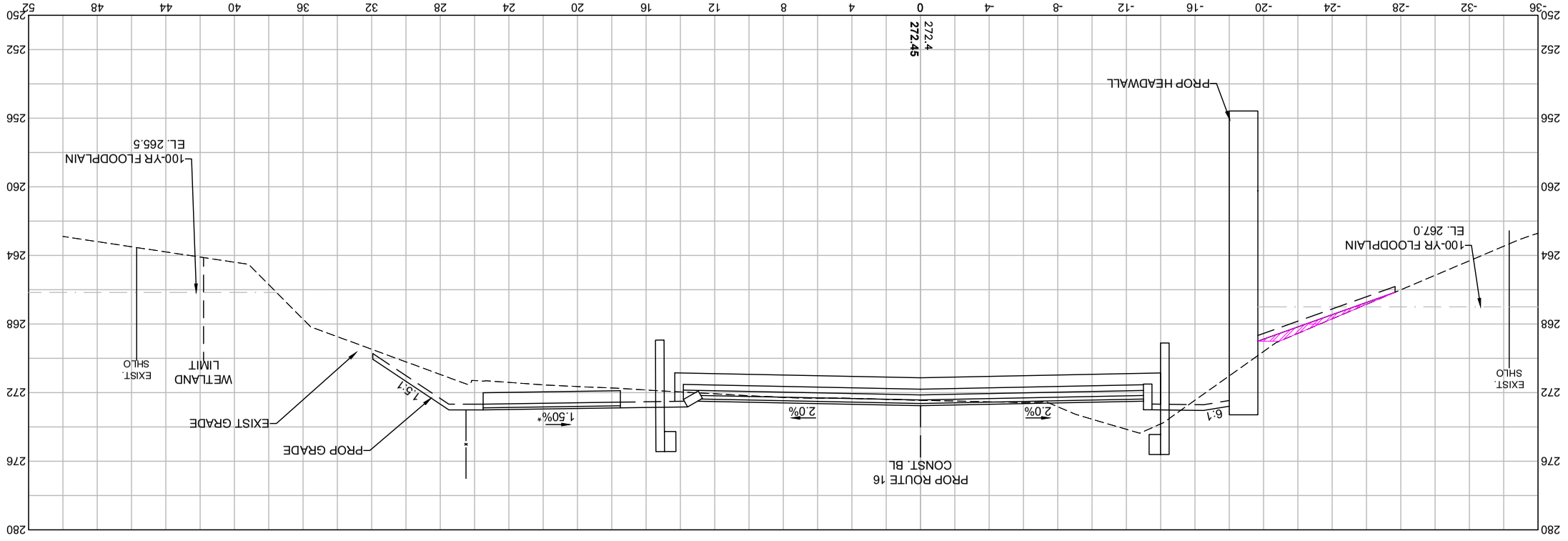
1. TEMPORARY IMPACTS TO LIMIT OF OHWM AND WATERS OF THE UNITED STATES WILL OCCUR DUE TO DEWATERING ACTIVITIES. FOR DETAILS ON TEMPORARY IMPACTS DUE TO DEWATERING, PLEASE SEE SHEET 16.
2. EROSION AND SEDIMENT CONTROLS SHALL TIE INTO INSTALLED COFFERDAM AT THE LIMIT OF DEWATERING.

LEGEND:

- = TEMPORARY IMPACT TO LIMIT OF OHWM
- = PERMANENT IMPACT TO LIMIT OF OHWM
- = TEMPORARY IMPACT TO WATERS OF THE UNITED STATES
- = PERMANENT IMPACT TO WATERS OF THE UNITED STATES
- = WETLAND DELINEATION LINES
- = LIMIT OF OHWM DELINEATION LINES
- = LIMIT OF 100-YR FLOOD ZONE

NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND
SEEDED WITH UPLAND SEED MIX

LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN



HOR. SCALE IN FEET
8 0 8 16

VER. SCALE IN FEET
8 0 8 16

MENDON
ROUTE 16

CULVERT FLOOD SECTIONS
SHEET 1 OF 3

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	20
PROJECT FILE NO. 608491			

Proposal No. 608491-131468

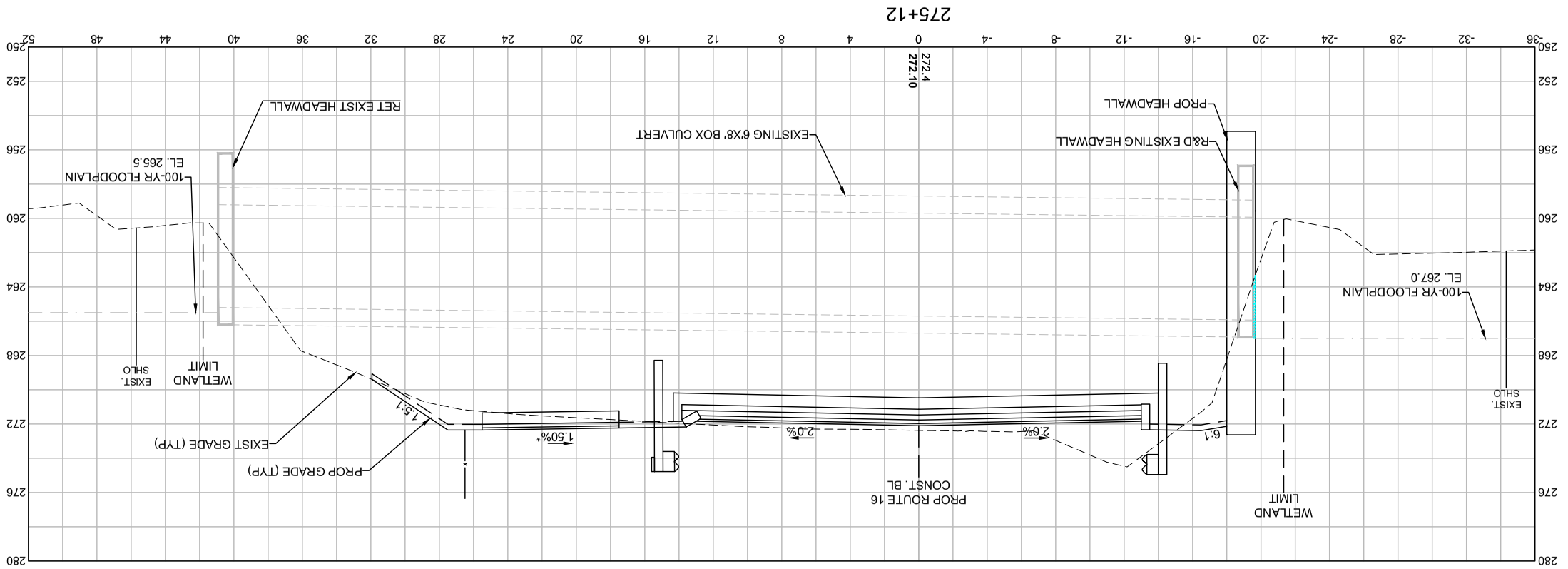
A00831 - 15

608491_EV8(FLOODSTORAGE).DWG Plotted on 3-Feb-2025 10:12 PM

NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND
SEEDED WITH UPLAND SEED MIX

LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN

HOR. SCALE IN FEET
8 0 8 16
VER. SCALE IN FEET
8 0 8 16



MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	20
PROJECT FILE NO. 608491			

CULVERT FLOOD SECTIONS
SHEET 2 OF 3

Proposal No. 608491-131468

A00831 - 16

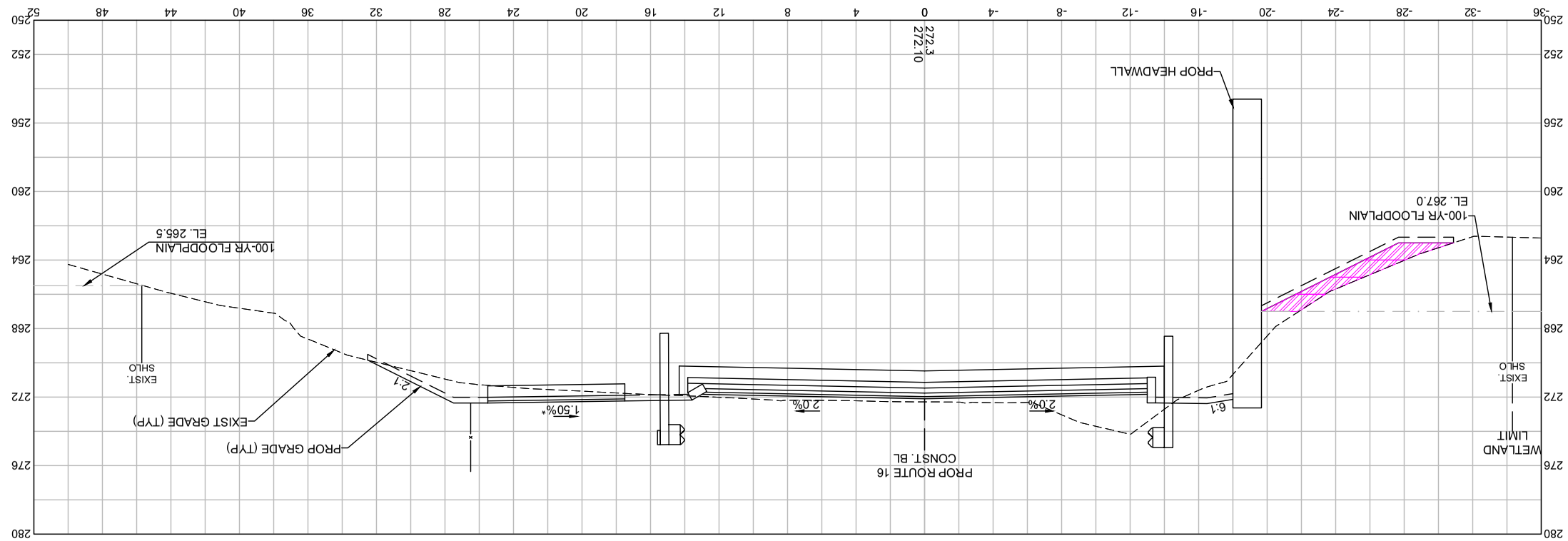
608491_EV8(FLOODSTORAGE).DWG Plotted on 3-Feb-2025 10:12 PM

NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND SEEDED WITH UPLAND SEED MIX

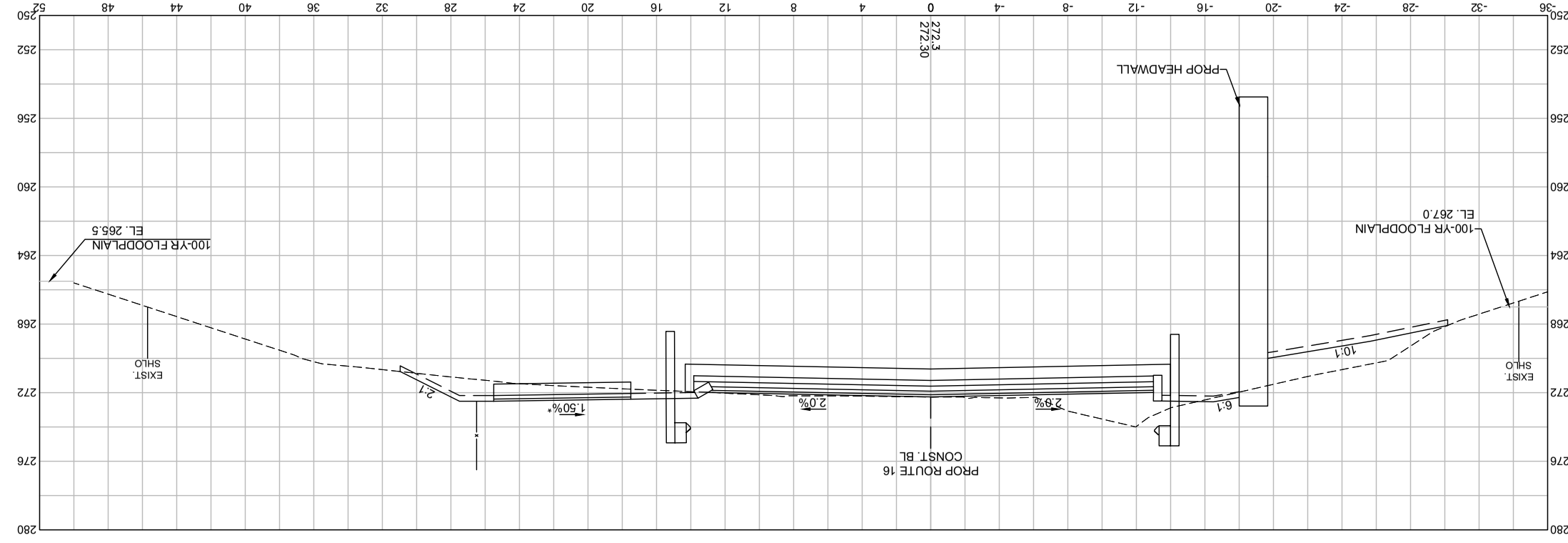
LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN

HOR. SCALE IN FEET
8 0 8 16
VER. SCALE IN FEET
8 0 8 16

275+30



275+40



MENDON
ROUTE 16
CULVERT FLOOD SECTIONS
SHEET 3 OF 3

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	20
PROJECT FILE NO. 608491			

A00831 - 17

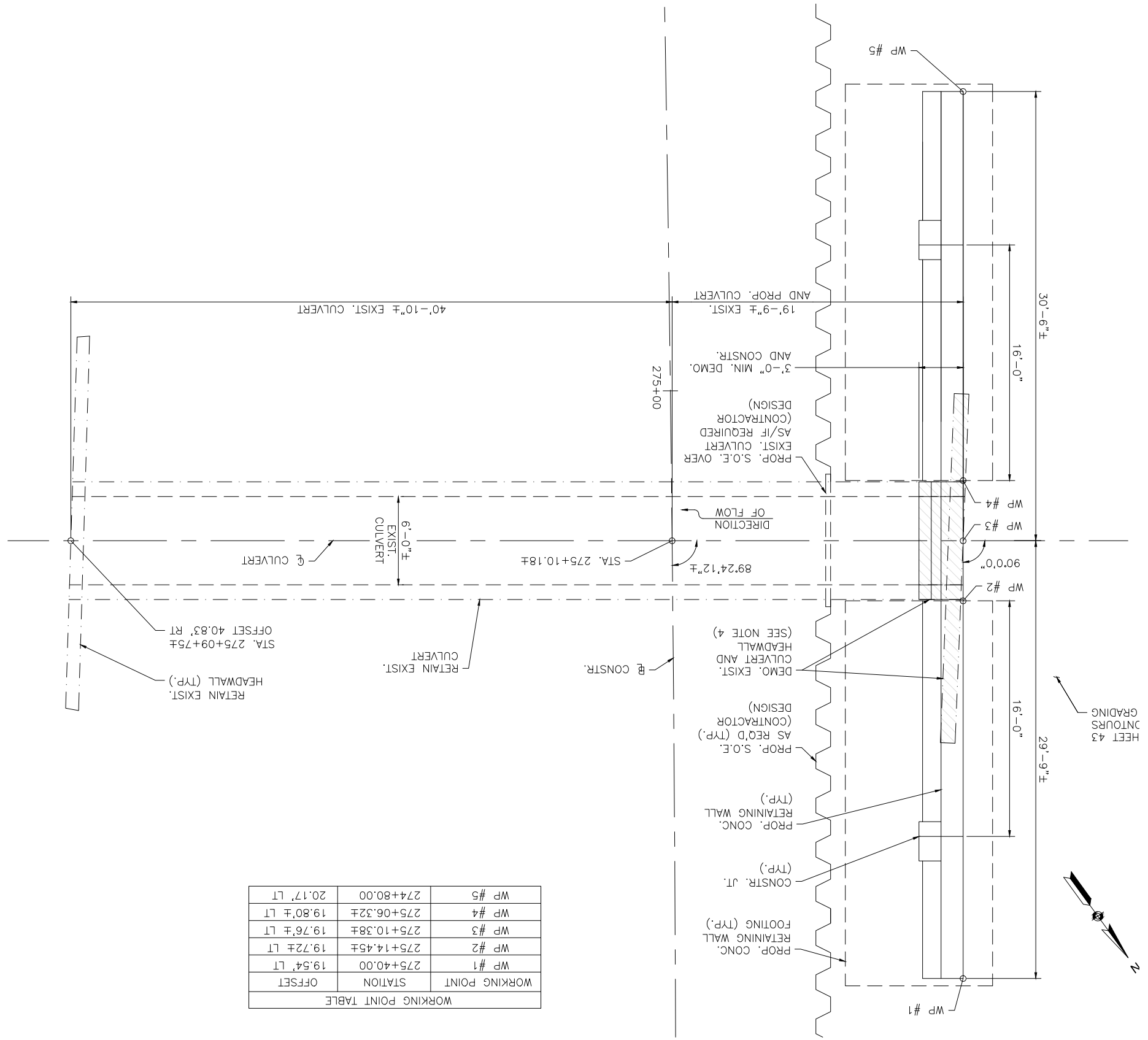
Proposal No. 608491-131468

608491_EV8(FLOODSTORAGE).DWG Plotted on 3-Feb-2025 10:12 PM

Proposal No. 608491-131468

MUDDY BROOK CULVERT PLAN

SCALE 1" = 1'-0"



WORKING POINT TABLE		
WORKING POINT	STATION	OFFSET
WP #1	275+40.00	19.54' LT
WP #2	275+14.45±	19.72± LT
WP #3	275+10.38±	19.76'± LT
WP #4	275+06.32±	19.80'± LT
WP #5	274+80.00	20.17' LT

NOTES:

1. SUPPORT OF EXCAVATION (SHEETING, PILES, ETC.) SHALL BE CUT OFF A MINIMUM OF 2 FEET BELOW PROPOSED GRADE IF LEFT IN PLACE.
2. SEE SHEET 32 FOR RETAINING WALL DETAILS.
3. SEE SHEET 34 FOR CONTROL OF WATER DETAILS AND HYDRAULIC DATA.
4. LIMITS OF EXISTING RETAINING HEADWALLS AND ANY ASSOCIATED FOOTINGS BELOW GRADE ARE UNKNOWN. SUPPORT OF EXCAVATION AS SHOWN MAY REQUIRE MODIFICATION TO AVOID CONFLICTS WITH EXISTING STRUCTURE.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE AND PROTECTION OF UNDERGROUND UTILITIES AND/OR STRUCTURES IN THE AREA OF CONSTRUCTION.

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	20
PROJECT FILE NO. 608491			

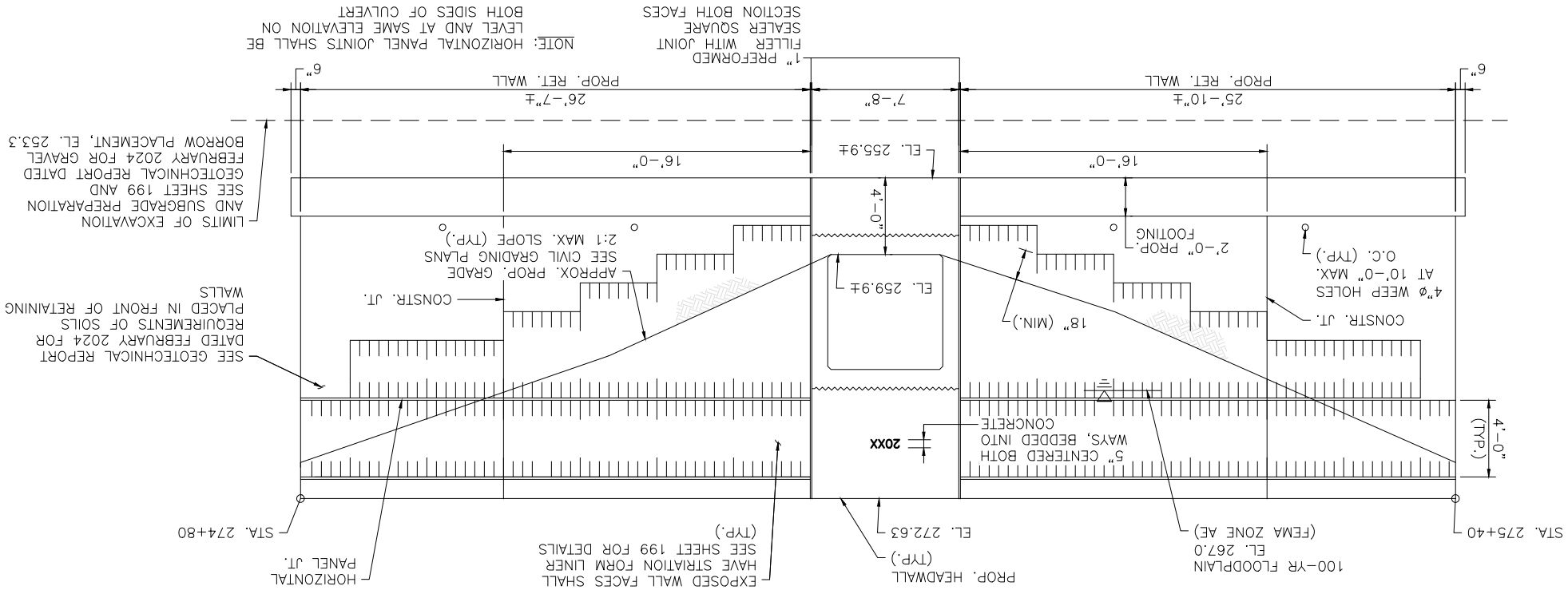
CULVERT PLAN

A00831 - 18

608491_EV7.1(CULVERT PLAN).DWG Plotted on 3-Feb-2025 10:20 PM

MUDDY BROOK CULVERT WEST ELEVATION

SCALE ¼" = 2'-0"

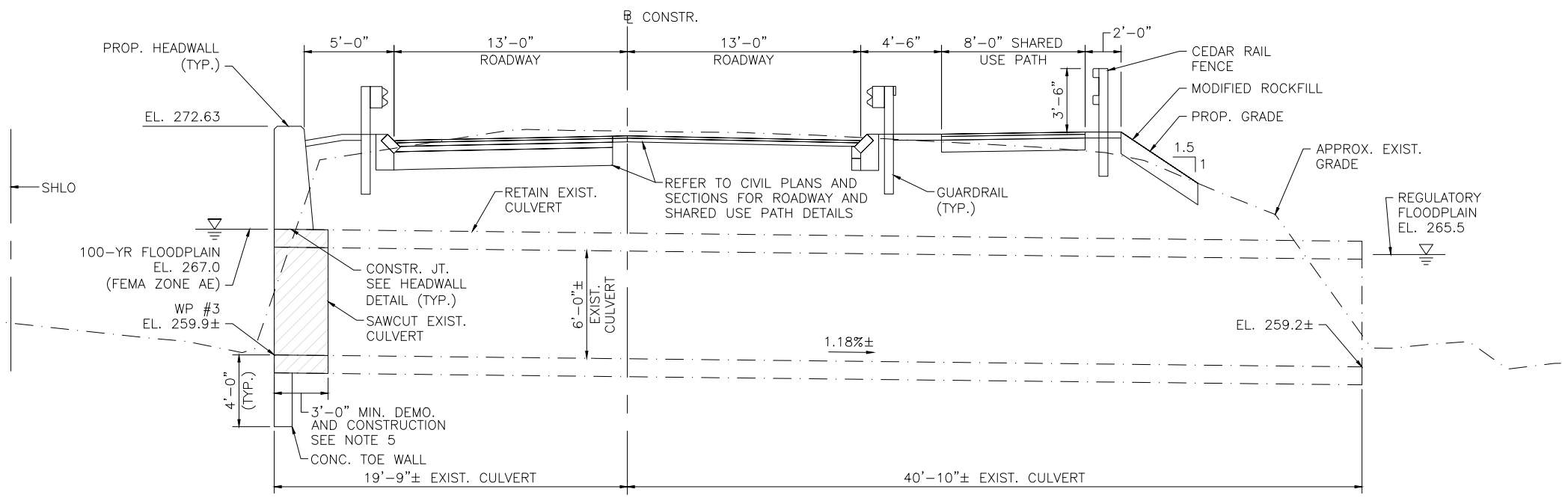


MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	20
PROJECT FILE NO. 608491			

CULVERT ELEVATIONS

A00831 - 19



MUDDY BROOK LONGITUDINAL SECTION
(LOOKING UP STATION)
SCALE ¼" = 1'–0"

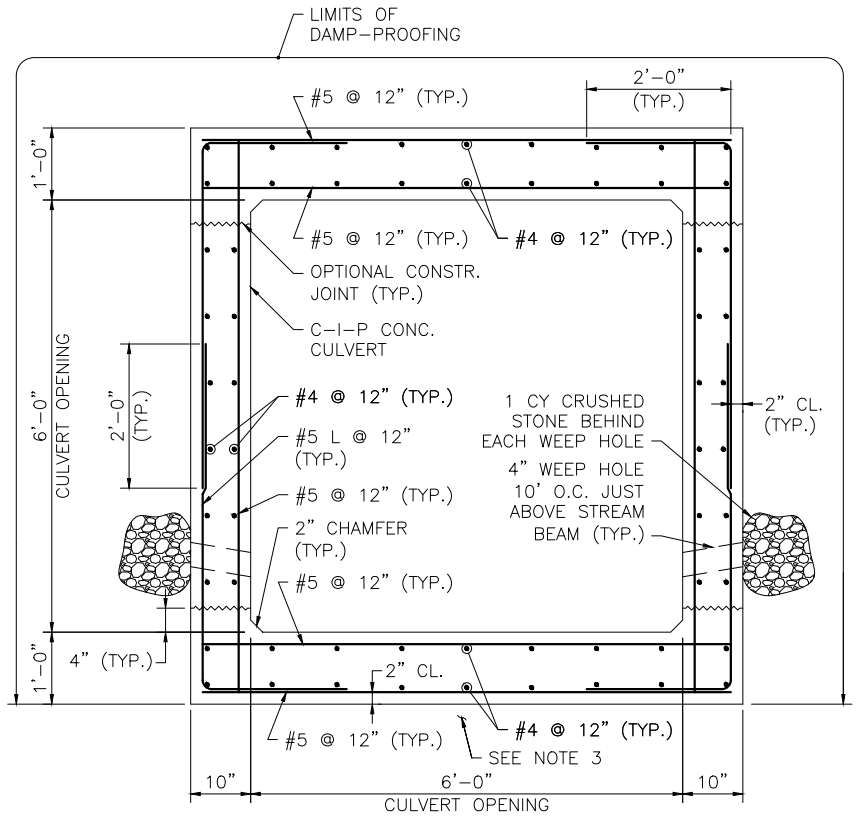
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	13	20
PROJECT FILE NO.	608491		

CULVERT LONG. SECTION AND DETAILS

NOTES:

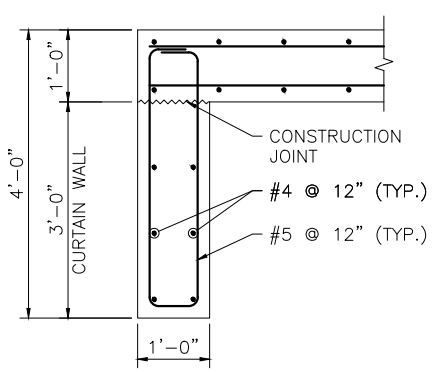
1. ALL CONCRETE SHALL BE 4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE.
2. CULVERT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
3. TRANSVERSE REINFORCEMENT SHALL BE PLACED NORMAL TO THE CENTERLINE OF THE CULVERT.
4. DEMOLITION OF EXISTING CULVERT AT THE EAST END SHALL EXTEND A MINIMUM OF 3'-0" AS SHOWN. CULVERT DEMOLITION SHALL EXTEND TO SOUND CONCRETE SECTION BEYOND THE LIMITS OF CRACKING AND SPALLING TO THE EXISTING CULVERT.



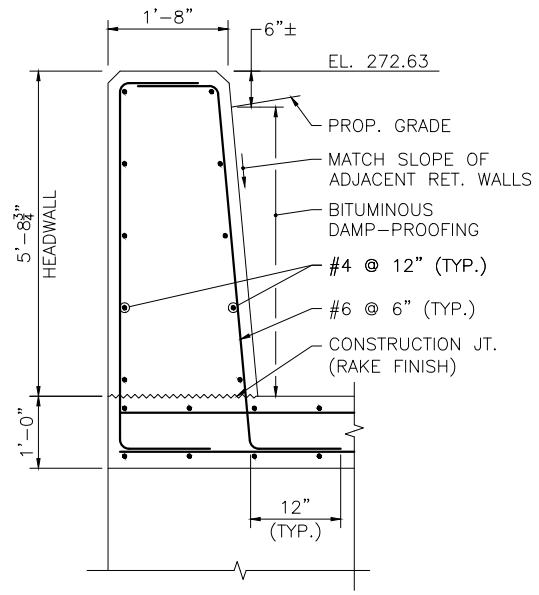
NOTES:

1. MAXIMUM FACTORED BEARING PRESSURE = 3 KSF.
2. FACTORED BEARING RESISTANCE = 6 KSF.

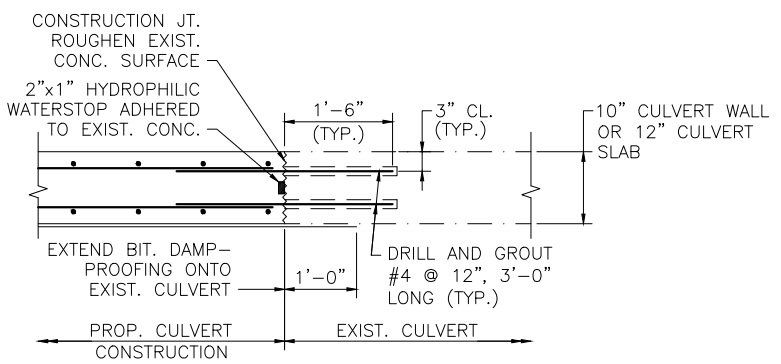
PROPOSED CULVERT SECTION
SCALE ¾" = 1'–0"



CURTAIN WALL DETAIL
SCALE ¾" = 1'–0"



HEADWALL DETAIL
SCALE ¾" = 1'–0"



EXISTING CULVERT CONNECTION
SCALE ¾" = 1'–0"

Proposal No. 608491-131468

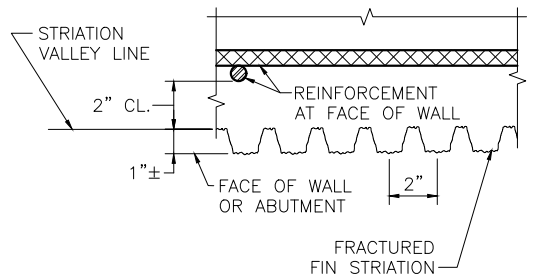
A00831 - 20

608491_EV7.3(CULVERT LONG SECTION).DWG Plotted on 3-Feb-2025 10:27 PM

Proposal No. 608491-131468

608491_EV7.22(CULVERT MISC).DWG Plotted on 3-Feb-2025 11:51 PM

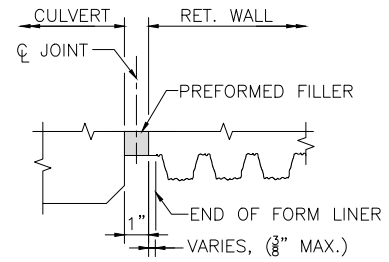
A00831 - 21



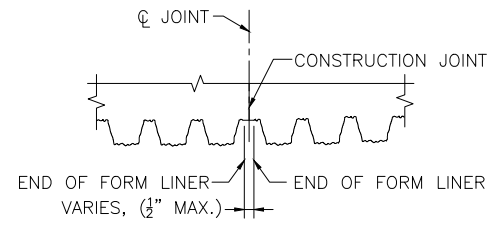
NOTES:

1. THE CONTRACTOR SHALL MAKE SURE THAT THE STRIATION FINS ARE PLUMB AND LINED UP VERTICALLY FROM PANEL TO PANEL FOR THE FULL HEIGHT OF THE WALL.
2. THE HORIZONTAL JOINT MAY BE OMITTED IF THE CONTRACTOR CAN DEMONSTRATE THAT THE FORM LINER PANELS CAN BE INSTALLED END TO END WITHOUT CREATING A VISIBLE SEAM IN THE FINAL CAST CONCRETE.

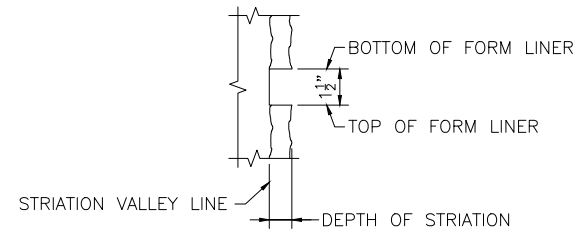
TYPICAL STRIATION DETAIL
SCALE: 3" = 1'-0"



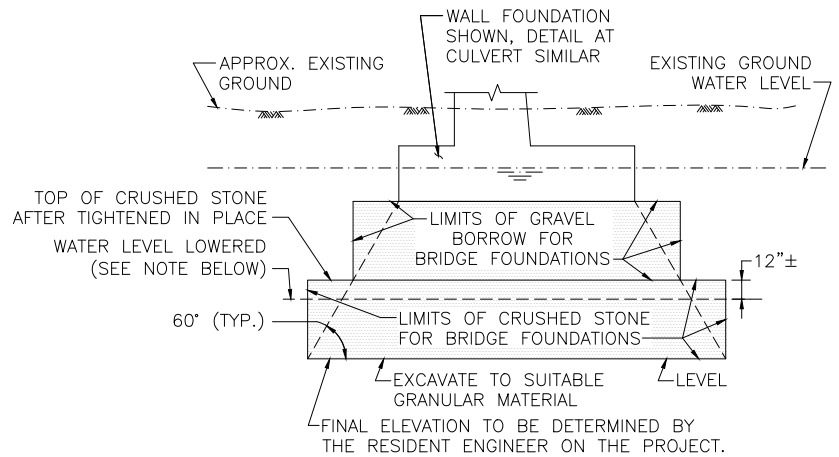
EXPANSION JOINT
SCALE: 3" = 1'-0"



CONSTRUCTION JOINT
SCALE: 3" = 1'-0"



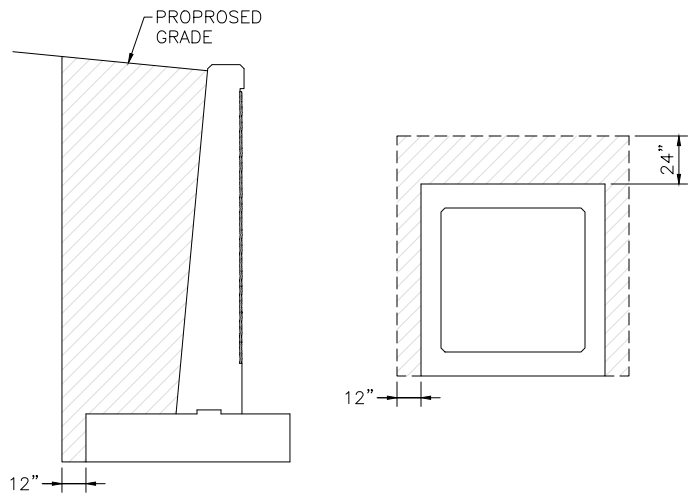
HORIZONTAL PANEL JOINT
SCALE: 3" = 1'-0"



NOTES:

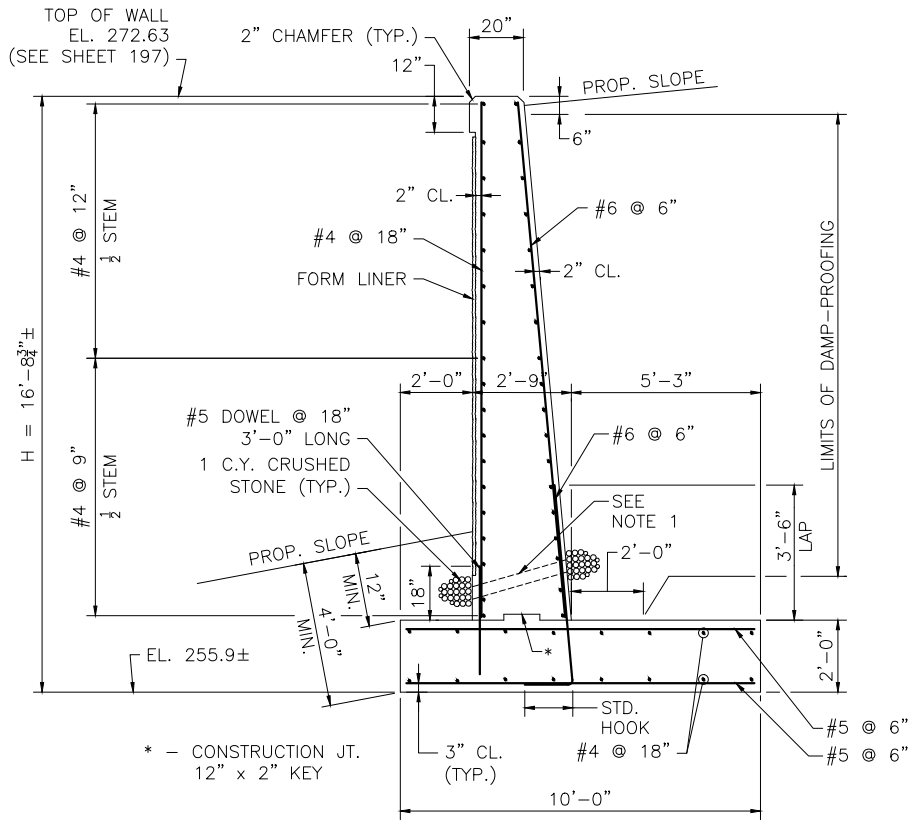
1. LOWER WATER LEVEL AS MUCH AS POSSIBLE WITHOUT DISTURBING THE GRANULAR SOIL (SIDES AND BOTTOM) AND TIGHTEN THE CRUSHED STONE IN PLACE (SEE STANDARD SPECIFICATIONS).
2. REPLACE SOILS ABOVE ELEVATION 253.3 FEET BELOW PROPOSED CULVERT AND CULVERT RETAINING WALL FOUNDATIONS WITH CRUSHED STONE AND OR GRAVEL BORROW AS SHOWN AND PER SPECIFICATIONS.

LIMITS OF CRUSHED STONE AND GRAVEL BORROW FOR WALL AND CULVERT FOUNDATIONS
N.T.S.

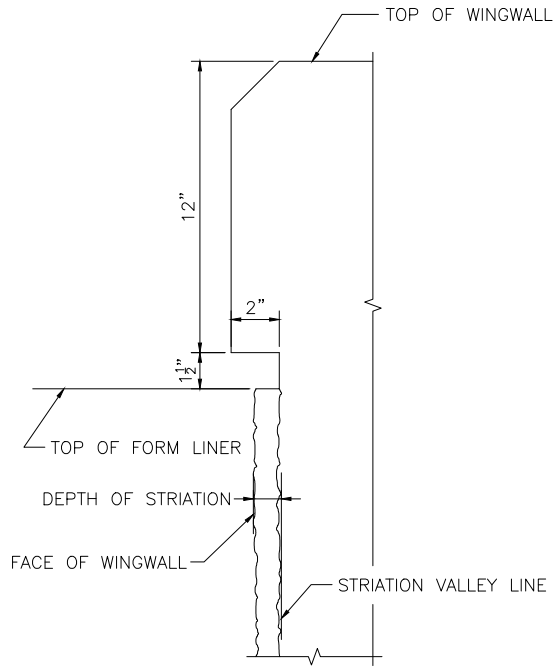


RETAINING WALL CULVERT EXTENSION

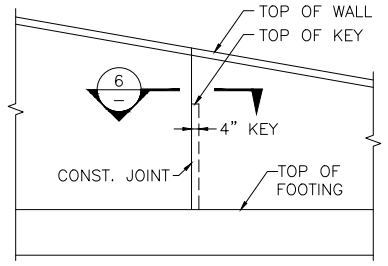
LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES
N.T.S.



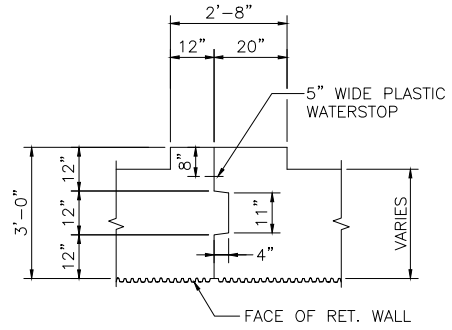
CULVERT RETAINING WALL SECTION
SCALE 3/8" = 1'-0"



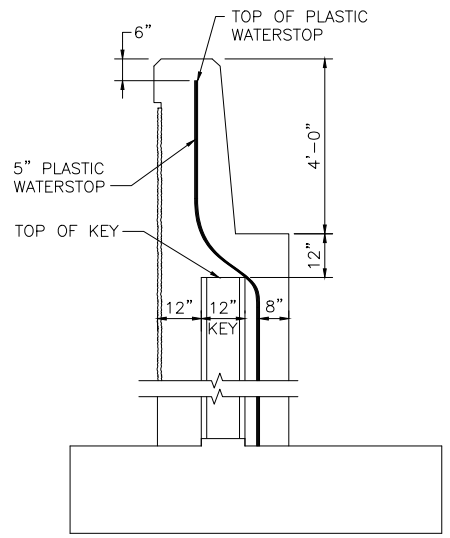
DETAIL AT TOP OF WINGWALL
SCALE: 3" = 1'-0"



WALL ELEVATION AT CONSTRUCTION JOINT
N.T.S.

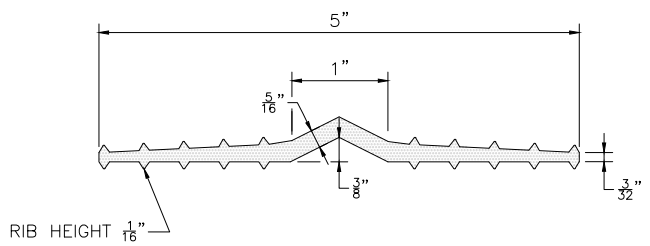


SECTION 6
N.T.S.



NOTE:
REINFORCEMENT SHALL BE CONTINUOUS THROUGH CONSTRUCTION JOINTS.

VERTICAL SECTION THROUGH CONSTRUCTION JOINT
N.T.S.



5" WATERSTOP
N.T.S.

RETAINING WALL TYPICAL SECTION

1. 4"ø WEEP HOLES AT 10'-0" MAX. O.C. LOCATED 12" ABOVE THE HEEL OF FOOTING SLOPING 1" PER FOOT TOWARDS FRONT FACE. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
2. RETAINING WALL GEOMETRY AND REINFORCEMENT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO ORDERING MATERIALS OR STARTING WORK.
3. ALL CONCRETE SHALL BE 5000 PSI, 3/4 INCH, 685 HP CAST-IN-PLACE CEMENT CONCRETE. ALL REINFORCEMENT SHALL BE EPOXY COATED

RETAINING WALL DESIGN PARAMETERS

1. BACKFILL AND LOADING CONDITIONS:

   LEVEL BACKFILL
   279 PSF LIVE LOAD SURCHARGE

2. BACKFILL SOIL PROPERTIES

   ø = ANGLE OF INTERNAL FRICTION = 32°
   δ = ANGLE OF WALL FRICTION = 21°
   γ = EFFECTIVE UNIT WIGHT = 130 PCF

3. FOUNDATION SOIL PROPERTIES:

   FACTORED BEARING RESISTANCE = 15.0 KSF
   COEFFICIENT OF FRICTION = 0.62
   RESISTANCE FACTOR FOR SLIDING = 1.0

4. REINFORCED CONCRETE:

   f'c = 5,000 PSI
   Fy = 60,000 PSI

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	15	20
PROJECT FILE NO.	608491		

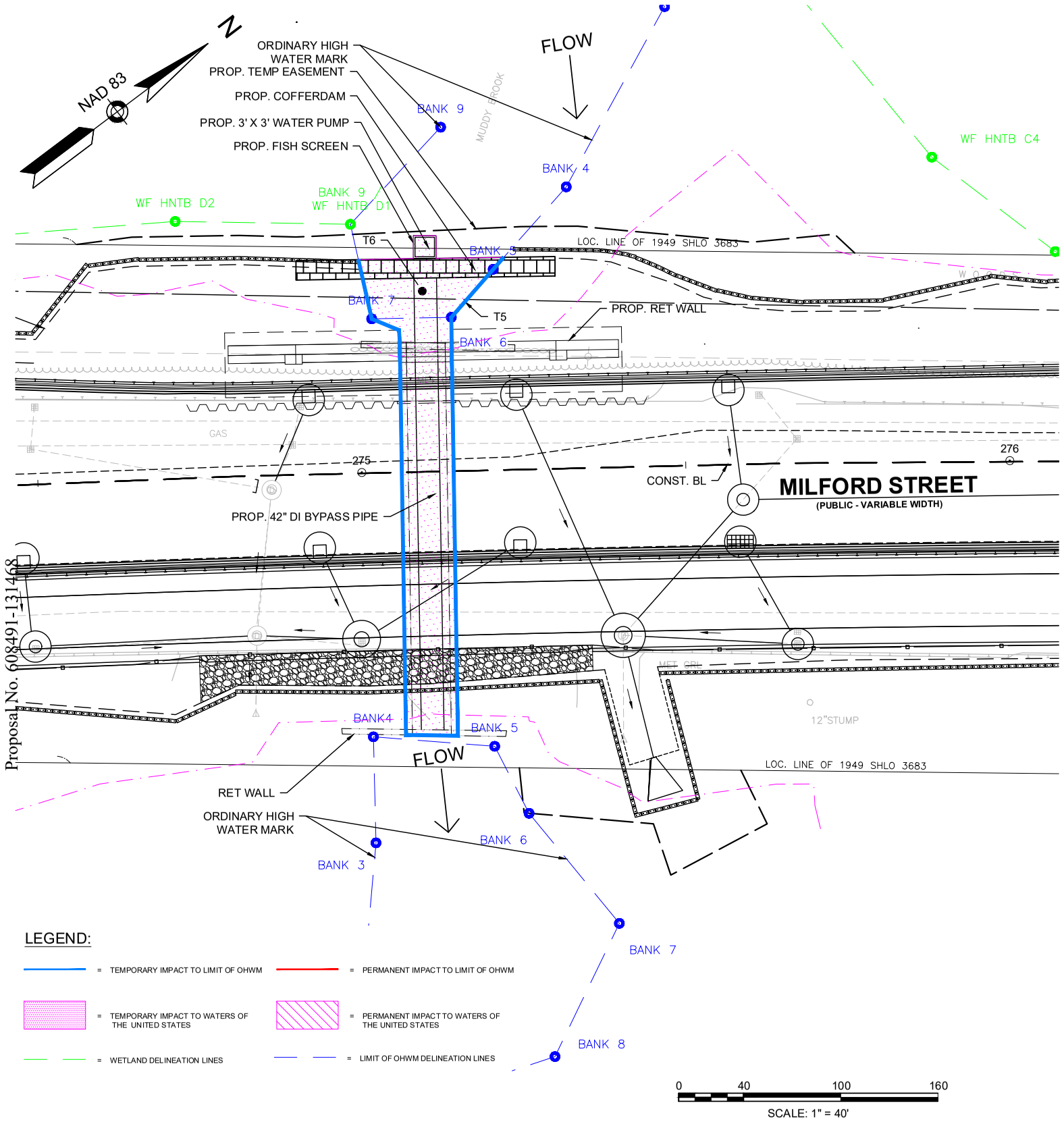
CULVERT RETAINING WALL DETAILS

Proposal No. 608491-131468
608491_EV7.21(CULVERT MISC).DWG Plotted on 3-Feb-2025 11:31 PM
A00831 - 22

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	16	38
PROJECT FILE NO.	608491		

CONTROL OF WATER



Proposal No. 608491-131468

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T5	TEMPORARY IMPACTS TO OHWM DUE TO CULVERT HEADWALL REPAIR WORK	HNTB-D / MUDDY BROOK	163 LF
T6	TEMPORARY IMPACTS TO WATERS OF THE UNITED STATES DUE TO CULVERT HEADWALL REPAIR WORK	HNTB-D / MUDDY BROOK	691 SQ. FT.

GENERAL UPSTREAM CULVERT HEADWALL REPLACEMENT NOTES:

1. THE WORK SHALL OCCUR ON ANY WEEKDAY MONDAY THROUGH FRIDAY. UNDER NO CIRCUMSTANCE WILL A DETOUR BE ESTABLISHED OVER THE WEEKEND WHICH INCLUDES FRIDAY NIGHT, ALL DAY SATURDAY AND SUNDAY.
2. ALL NECESSARY PERMITS FROM THE TOWN OF MENDON AND REGULATORY AGENCIES SHALL BE APPROVED PRIOR TO COMMENCEMENT OF WORK.
3. WATER LEVELS ARE SUBJECT TO CHANGE, THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS/HER OWN DETERMINATION OF WATER LEVELS THAT WILL EXIST DURING CONSTRUCTION.
4. UPON INSTALLATION AND INSPECTED ACCEPTANCE OF ALL SEDIMENT CONTROL MEASURES, THE CONTRACTOR SHALL BEGIN IMPLEMENTING THE STREAM DIVERSION AND DEWATERING PLAN.
5. CONTRACTOR IS RESPONSIBLE FOR INSTALATION OF A FISH PROTECTION SCREEN PRIOR TO THE START OF ANY DEWATERING ACTIVITIES.
6. CONTRACTOR IS RESPONSIBLE FOR CONDUCTING ALL DEWATERING ACTIVITIES DURING TIME OF YEAR (TOY) RESTRICTIONS AS REQUIRED BY MASSDEP.
7. PER OSHA REQUIREMENTS, CONTRACTOR TO PROVIDE A MINIMUM 10 FEET BETWEEN OPERATING EQUIPMENT, PRECAST PANELS ETC. AND OVERHEAD WIRES/UTILITY POLES.
8. INSTALL AN UPSTREAM/DOWNSTREAM COFFERDAM TO DIVERT THE FLOW OF WATER INTO THE BYPASS PIPE TO CREATE A DRY AREA ON THE DOWNSTREAM SIDE OF THE COFFERDAM. CONTRACTOR SHALL USE A WOVEN POLYPROPYLENE BAG COFFERDAM WITH BENTONITE LINING OR APPROVED EQUAL. CONTRACTOR MAY SUPPLEMENT COFFERDAM WITH TEMPORARY PRECAST CONCRETE BARRIER. CONTRACTOR TO USE A SLING TO LIFT BAG AND ONLY USE CLEAN PEA GRAVEL TO FILL BAGS. COFFERDAM HEIGHT SHALL BE 1 FOOT ABOVE THE DESIGN HIGH WATER ELEVATION FOR A TWO YEAR STORM OF 262.61'.

9.1 UPSTREAM WATER NOTES:
2-YEAR ELEVATION HEADWATER: 262.61'

9.2. WATER SURFACE ELEVATIONS AT DOWNSTREAM CULVERT:
100 YEAR FLOOD ELEVATION: 265.5'
10 YEAR FLOOD ELEVATION: 263.58'
WATER ELEVATION: 259.20'

EROSION AND SEDIMENT CONTROL SEQUENCE OF CONSTRUCTION NOTES:

1. PRIOR TO COMMENCEMENT OF LAND DISTURBING ACTIVITIES THE CONTRACTOR SHALL CONDUCT A MEETING ON SITE WITH THE TOWN OF MENDON AND MASSDOT TO DISCUSS THE APPROACH TO EROSION AND SEDIMENT CONTROL AND TO NOTE ANY SPECIAL CONDITIONS OR REQUIREMENTS FOR THE PROJECT.
2. PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITIES, INSTALL ALL PERIMETER EROSION CONTROL DEVICES AND THE CONSTRUCTION ENTRANCE. DISTURBANCE SHALL BE LIMITED TO THE MINIMUM REQUIRED TO INSTALL THE EROSION CONTROL MEASURES.
3. UPON APPROVAL OF INSTALLATION OF EROSION AND SEDIMENT CONTROL PERIMETER DEVICES, COMMENCE WITH SITE CLEARING AND GRUBBING ACTIVITIES.
4. STABILIZE ALL DENUDED AREAS WITHIN 7 DAYS OF DISTURBANCE WITH TEMPORARY OR PERMANENT VEGETATION AND SOIL STABILIZATION BLANKETS.
5. INSTALL UTILITIES AND GRADE IN ACCORDANCE WITH THE PLANS. CONSTRUCT PROPOSED DESIGN ELEMENTS INCLUDING PRECAST CULVERT, SIDE SLOPES AND ROADWAY IN ACCORDANCE WITH THE PLANS.
6. MAINTAIN SERVICE OF ALL EXISTING UTILITIES THROUGHOUT CONSTRUCTION. COORDINATE AND PLAN ANY UTILITY INTERRUPTIONS WITH THE TOWN OF MENDON.
7. MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES THROUGHOUT THE DURATION OF CONSTRUCTION. NO AREA SHALL REMAIN DENUDED MORE THAN 7 DAYS WITHOUT STABILIZATION.
8. INSPECT CONTROLS ON A WEEKLY BASIS AND AFTER EVERY STORM EVENT, ESPECIALLY AT THE PERIMETER. REPAIR ALL DAMAGED DEVICES IMMEDIATELY. COST OF REPAIR OF DAMAGED CONTROLS IS INCIDENTAL TO THE CONTRACT.

GENERAL CONSTRUCTION STAGING NOTES:

1. NO STAGING OR STOCKPILE AREAS SHALL BE ALLOWED IN THE 100 YEAR FLOODPLAIN OR ANY OTHER ENVIRONMENTALLY SENSITIVE AREA. THE 100-YEAR FLOODPLAIN ELEVATION IS ASSUMED TO BE ELEVATION 265.5 ON DOWNSTREAM SIDE AND 267 ON UPSTREAM SIDE. CONTRACTOR SHALL COORDINATE LOCATION AND SIZE OF PROSPECTIVE CONSTRUCTION LAYDOWN AREA PRIOR TO COMMENCEMENT OF WORK AND OBTAIN APPROVAL WITH THE TOWN OF MENDON. ALL WORK STORAGE, OR ANY OTHER STAGING AREAS SHALL BE STABILIZED AS NECESSARY DURING CONSTRUCTION AND UNPAVED TRAFFIC AREAS SHALL BE MATTED OR GRAVELED AND ALL CONSTRUCTION EQUIPMENT USED WITHIN THE STREAM DIVERSION MUST BE PLACED ON MATS.
2. AT THE CONTRACTORS PREFERENCE, AN ALTERNATIVE SEQUENCE OF CONSTRUCTION MAY BE PROPOSED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING THE APPROPRIATE PLANS AND REQUEST IN WRITING FOR A CHANGE TO THESE PLANS AND OBTAIN APPROVAL BY MASSDOT. NO ADDITIONAL COMPENSATION WILL BE ALLOWED FOR DELAYS CAUSED BY THE REVIEW AND APPROVAL PROCESS NOR WILL ADDITIONAL COMPENSATION BE ALLOWED IF ANY PROPOSED CHANGE IS REJECTED. MASSDOT AND OTHER PERMITTING AGENCIES SHALL DETERMINE WHETHER ANY PROPOSED ALTERNATE SEQUENCE IS ACCEPTABLE. IF NO ALTERNATE IS FOUND ACCEPTABLE THEN THE SEQUENCE SHOWN ON THESE PLANS SHALL BE FOLLOWED. CONTRACTOR SHALL SUBMIT PLANS AND CONSTRUCTION SEQUENCE FOR DEWATERING A TWO YEAR STORM AS STATED IN THE MASSDOT BRIDGE MANUAL.
3. ALL LAND WHICH IS DISTURBED BY THE CONTRACTOR, AND WHICH IS NOT BUILT UPON OR SURFACED, SHALL BE ADEQUATELY STABILIZED TO CONTROL EROSION AND SEDIMENTATION IN CONFORMANCE WITH THE CURRENT MASSDOT AND TOWN OF MENDON GUIDELINES.
4. THE DIVERSION IS NOT INTENDED TO BLOCK HIGHWATER EVENTS FROM FLOODING THE DEWATERED AREAS. NO EQUIPMENT OR UNSECURED MATERIALS WILL BE ALLOWED OVERNIGHT WITHIN THE STREAM BANKS IN CASE FLOODING OCCURS.
5. ALL PLACEMENT, ADJUSTMENTS, ETC. OF THE STREAM DIVERSION SHALL BE PERFORMED WHILE OBSERVING ANY IN-STREAM WORK RESTRICTIONS.
6. THE COST OF THE STREAM DIVERSION AND REQUIRED EQUIPMENT (PIPE, RIPRAP OUTLET PADS, PUMPS, SAND BAGS, ETC.) IS TO BE CONSIDERED INCIDENTAL TO ITEM 991.1 CONTROL OF WATER.
7. MATERIAL FOR CONSTRUCTION OF ANY KIND SHALL NOT BE STAGED WITHIN 100 FEET OF A WETLAND RESOURCE AREA THROUGHOUT THE DURATION OF CONSTRUCTION.
8. PRIOR TO COMMENCEMENT OF CULVERT WORK, DOWNSTREAM AREA SHALL BE PROTECTED FROM SCOUR AND POTENTIAL VELOCITY-INDUCED EROSION THROUGH THE INSTALLATION OF A TEMPORARY CONCRETE SCOUR PAD (4'X10'X6").
9. CONTRACTOR TO SUBMIT PLAN FOR DEWATERING WITHIN IN THE COFFERDAM ON THE UPSTREAM SIDE.

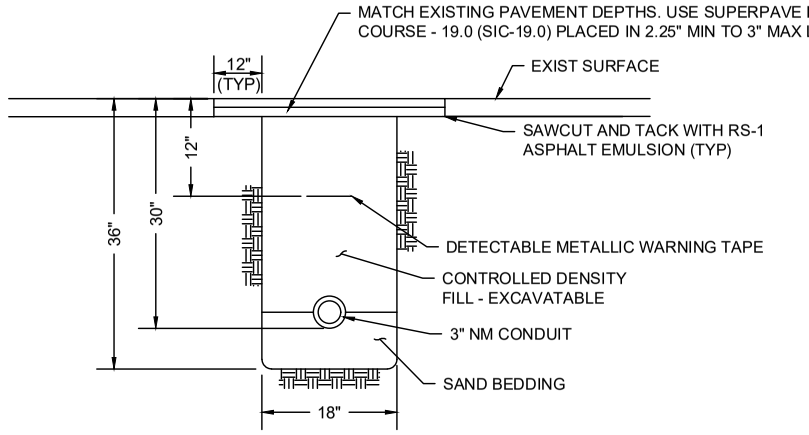
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608491_EV10(CONTROL OF WATER).DWG Plotted on 20-Feb-2025 2:46 PM

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	20
PROJECT FILE NO.	608491		

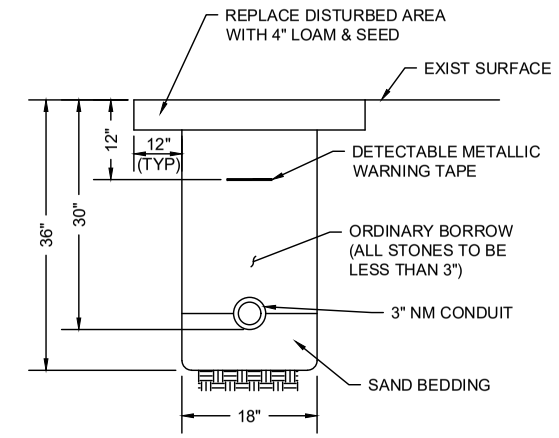
CONSTRUCTION DETAILS
SHEET 1 OF 4

608491_EV9(CONST DETAILS).DWG Plotted on 3-Feb-2025 10:52 PM



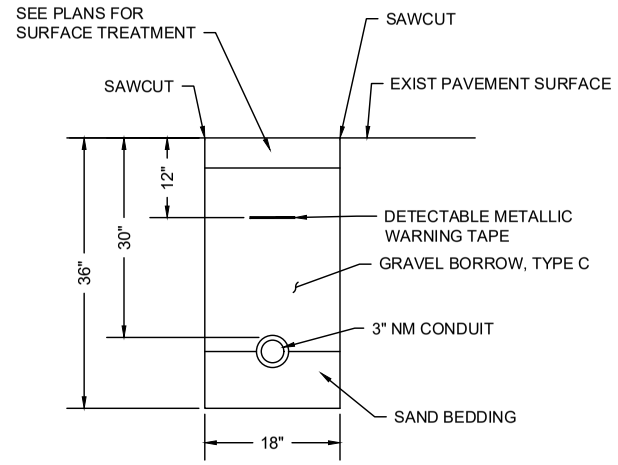
CONDUIT IN CROSSING ROADWAY
NOT TO SCALE

NOTES:
1. TEMPORARY PATCHING WITHIN MILL AND OVERLAY AREAS SHALL BE PAID FOR UNDER ITEM 451.
2. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. CONTROL DENSITY FILL SHALL MEET THE REQUIREMENTS OF MASSDOT MATERIAL SPECIFICATION M4.08.0.
4. WARNING TAPE SHALL BE PER CURRENT AMERICAN PUBLIC WORKS ASSOCIATION STANDARDS.



CONDUIT IN GRASS
NOT TO SCALE

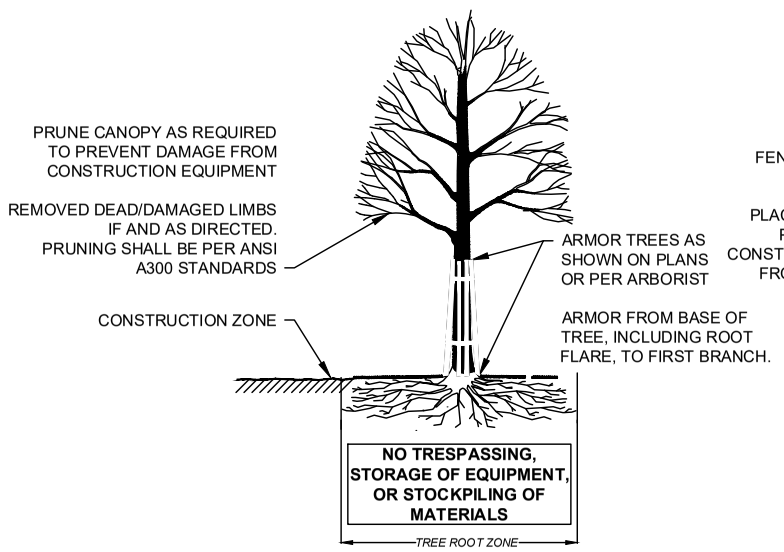
NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.



CONDUIT IN SIDEWALK
NOT TO SCALE

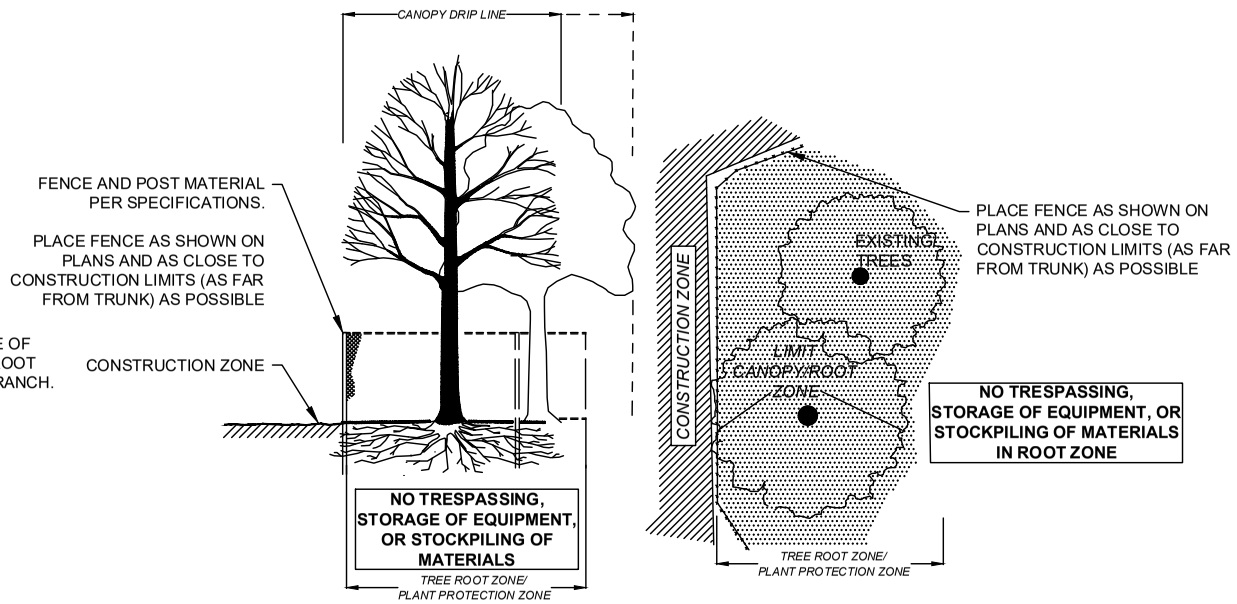
NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.

Proposal No. 608491-131468



SECTION - TRUNK ARMORING & PRUNING

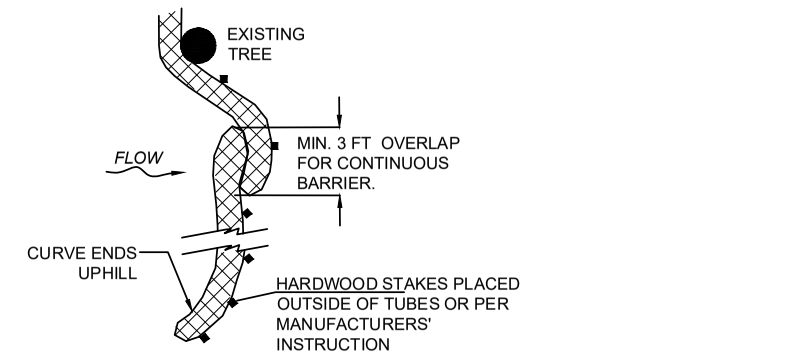
TREE PROTECTION - TRUNK
NOT TO SCALE



SECTION - FENCE PROTECTION OF ROOT ZONE

PLAN VIEW - FENCE PROTECTION OF ROOT ZONE

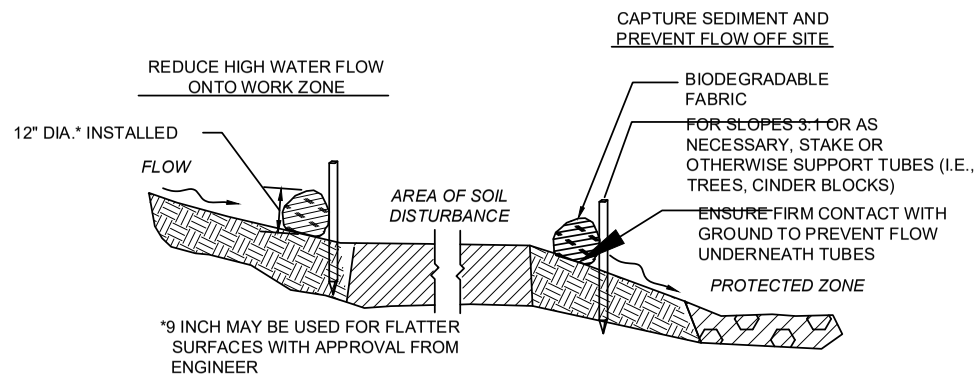
TREE PROTECTION - ROOT ZONE
NOT TO SCALE



PLACE TUBE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE, ALONG CONTOURS, AND PERPENDICULAR TO FLOW.

ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLAN VIEW

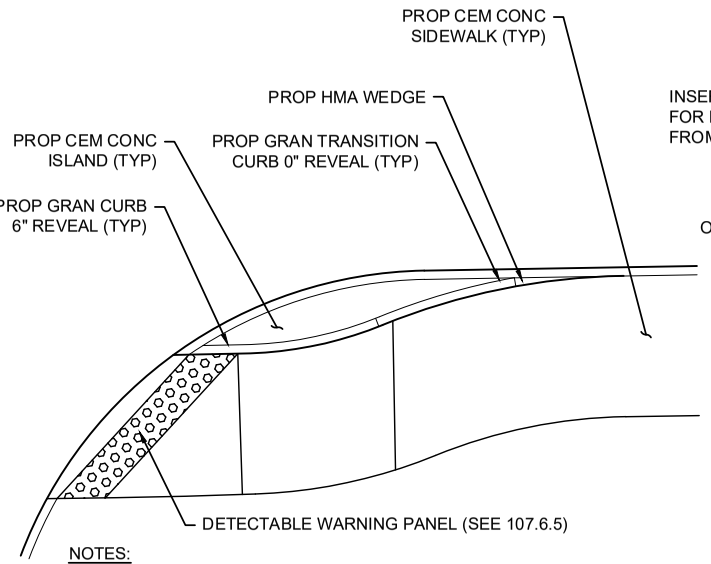


SECTION

SEDIMENT CONTROL BARRIER
NOT TO SCALE

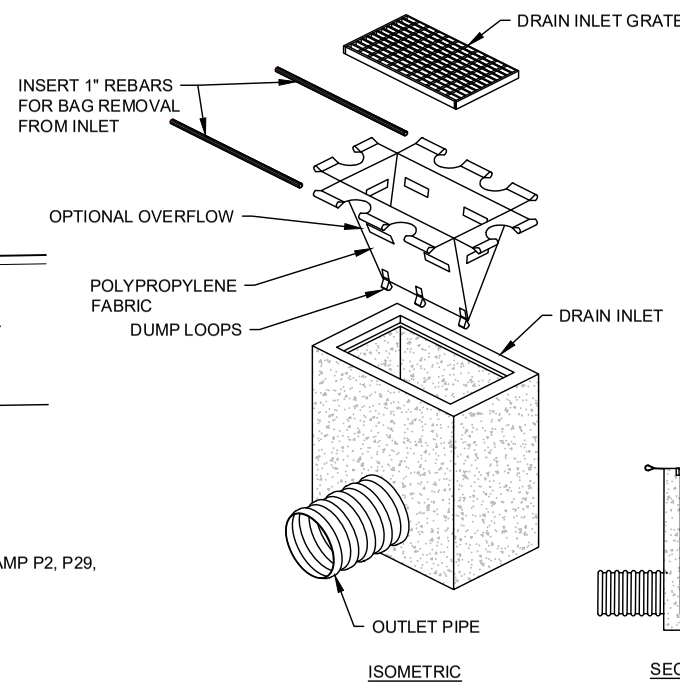
A00831 - 24

608491_EV9(CONST DETAILS).DWG Plotted on 3-Feb-2025 10:52 PM



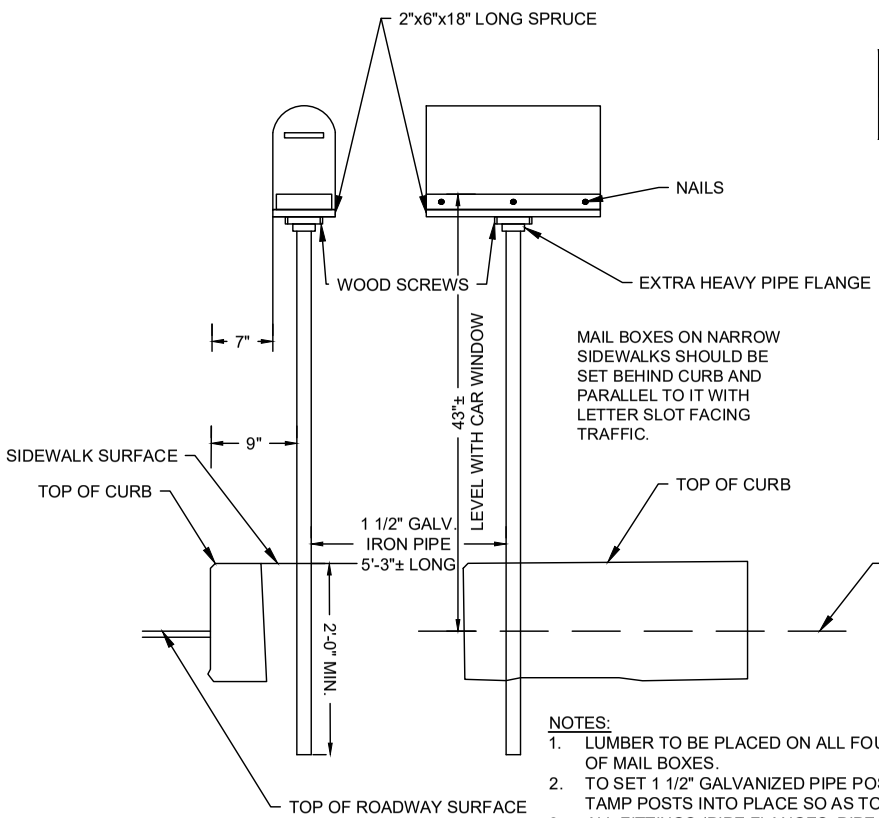
NOTES:
1. SPLAYED END TREATMENT TO BE USED AT PEDESTRIAN CURB RAMP P2, P29, P30 & P32.

SPLAYED END CURB TREATMENT
NOT TO SCALE



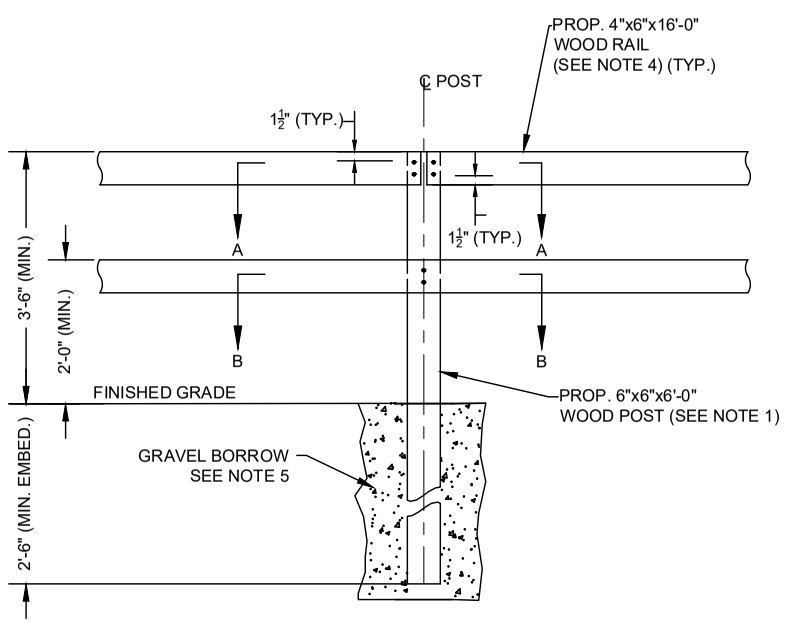
NOTES:
1. INSTALL DRAIN INLET PROTECTION PER MANUFACTURER'S SPECIFICATIONS.
2. REMOVE DRAIN INLET GRATE AND INSTALL POLYPROPYLENE FABRIC OVER DRAIN INLET FRAME. REPLACE DRAIN INLET GRATE TO SECURE POLYPROPYLENE FABRIC IN PLACE.
3. LENGTH AND WIDTH SHALL BE MANUFACTURED TO FIT THE OPENING OF THE DRAIN INLET.
4. MAINTENANCE: REMOVE ALL ACCUMULATED SEDIMENT AND DEBRIS FROM SURFACE AND VICINITY OF UNIT AFTER EACH STORM EVENT. REMOVE SEDIMENT THAT HAS ACCUMULATED WITHIN THE CONTAINMENT AREA OF THE DRAIN INLET PROTECTION SACK AS NEEDED.

TYPICAL DRAIN INLET PROTECTION
NOT TO SCALE

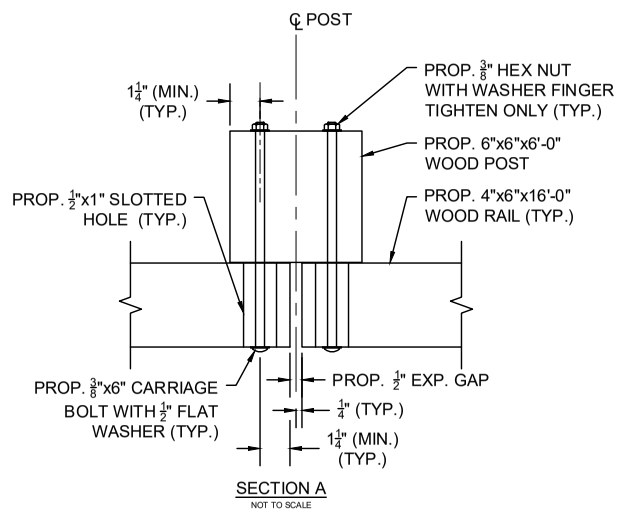


NOTES:
1. LUMBER TO BE PLACED ON ALL FOUR SIDES TO FULL 2"x6" SIZE TO FIT BOTTOM OF MAIL BOXES.
2. TO SET 1 1/2" GALVANIZED PIPE POST, USE DRIVING POINT OF SAME SIZE, THEN TAMP POSTS INTO PLACE SO AS TO BE PLUMB BOTH WAYS.
3. ALL FITTINGS (PIPE FLANGES, PIPE, SCREWS, NAILS, ETC.) ARE TO BE GALVANIZED.
4. FOR DESCRIPTIONS, MATERIALS, AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.
5. A 4"x4" PRESSURE TREATED WOOD POST MAY BE SUBSTITUTED FOR A PIPE POST.

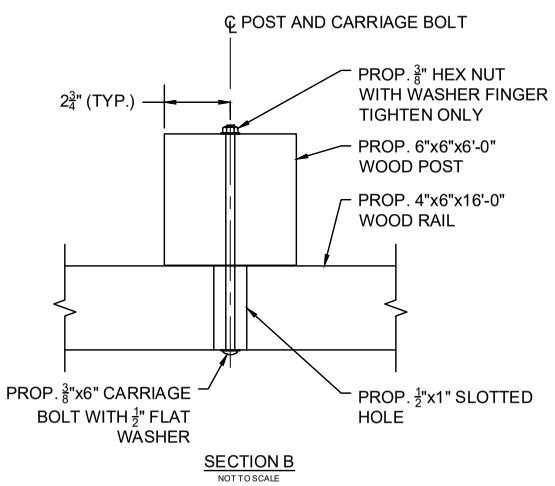
RESIDENTIAL MAILBOX
NOT TO SCALE



WOOD RAILING DETAIL
NOT TO SCALE

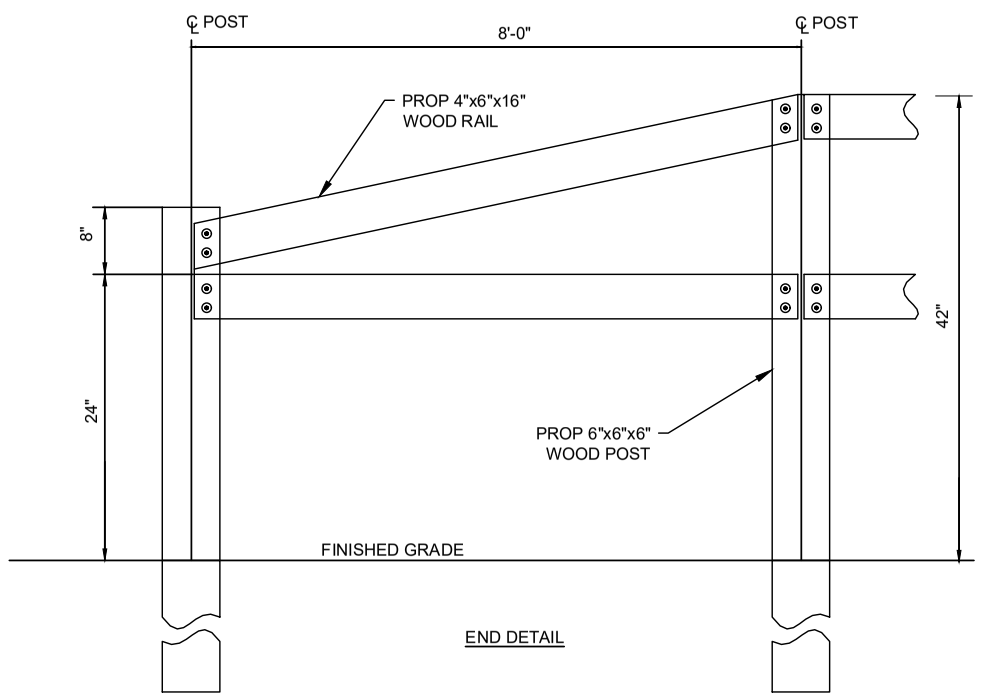


SECTION A
NOT TO SCALE

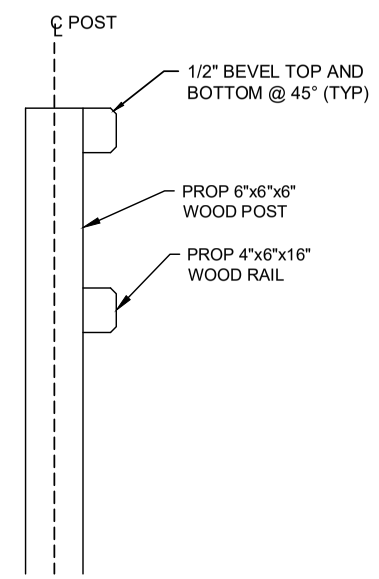


SECTION B
NOT TO SCALE

WOOD RAILING
NOT TO SCALE



END DETAIL



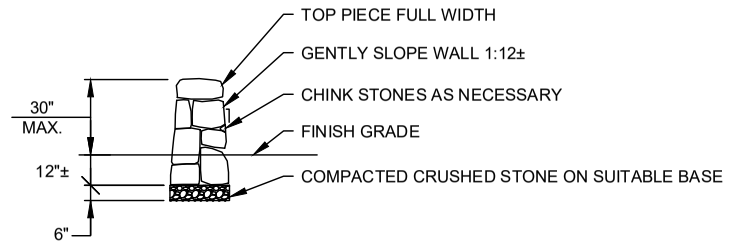
NOTES:
1. POSTS SHALL BE PLACED 8'-0" ON CENTER.
2. THE FACE OF RAIL SHALL BE SET OFF THE EDGE OF BIKE PATH PAVEMENT, AS SHOWN ON THE PLANS, AND AS DIRECTED BY THE ENGINEER.
3. ALL HARDWARE SHALL BE GALVANIZED.
4. ALTERNATE JOINTS IN RAILING BETWEEN POSTS
5. CONTRACTOR SHALL SET POST IN 4,000 PSI, 1-1/2IN, 565 CEMENT CONCRETE FOR ALL POSTS UNABLE TO BE SET AT REQUIRED DEPTH.
6. THESE RAILS SHALL ONLY BE INSTALLED BETWEEN POSTS ADJACENT TO RETAINING WALL LOCATIONS.

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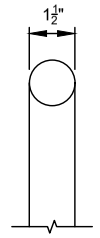
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	20
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 3 OF 4

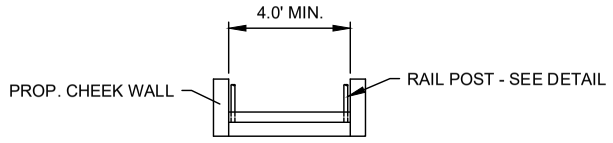
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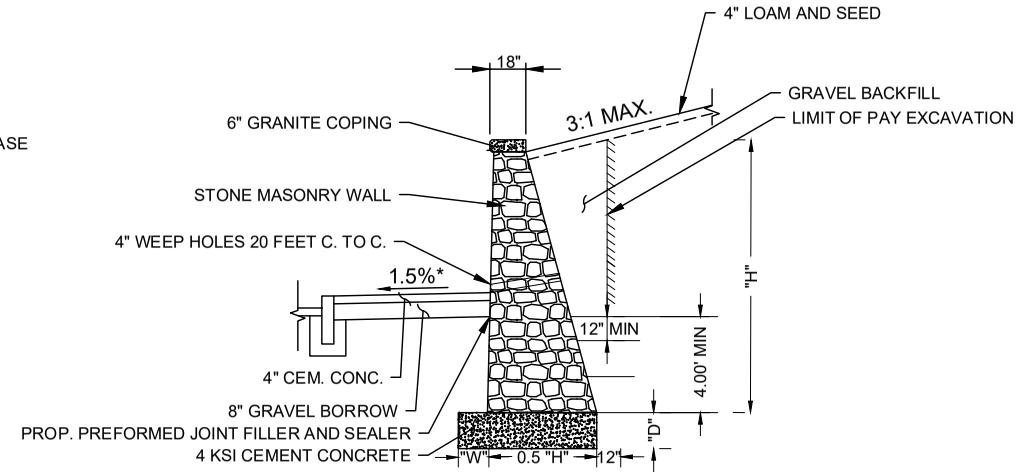
R&R BALANCE STONE WALL
NOT TO SCALE



HANDRAIL
NOT TO SCALE

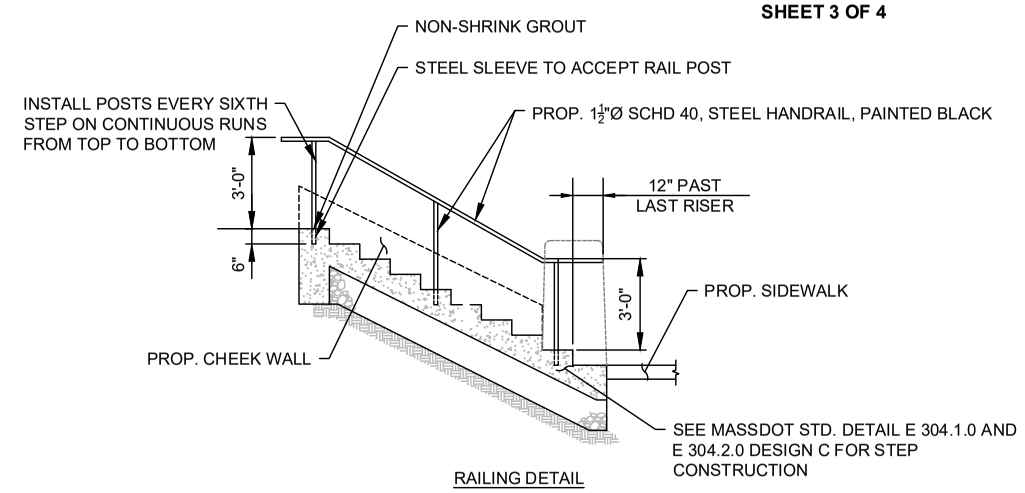


HANDRAIL - SECTION
NOT TO SCALE



NOTE:
1. SEE MASSDOT STANDARD DETAIL E 302.2.0 FOR FURTHER INFORMATION.
2. H, D AND W ALL VARY DEPENDING ON STANDARD DETAIL E 302.2.0.

WALL TYPE - LOW CEMENTED STONE MASONRY RETAINING WALL
NOT TO SCALE

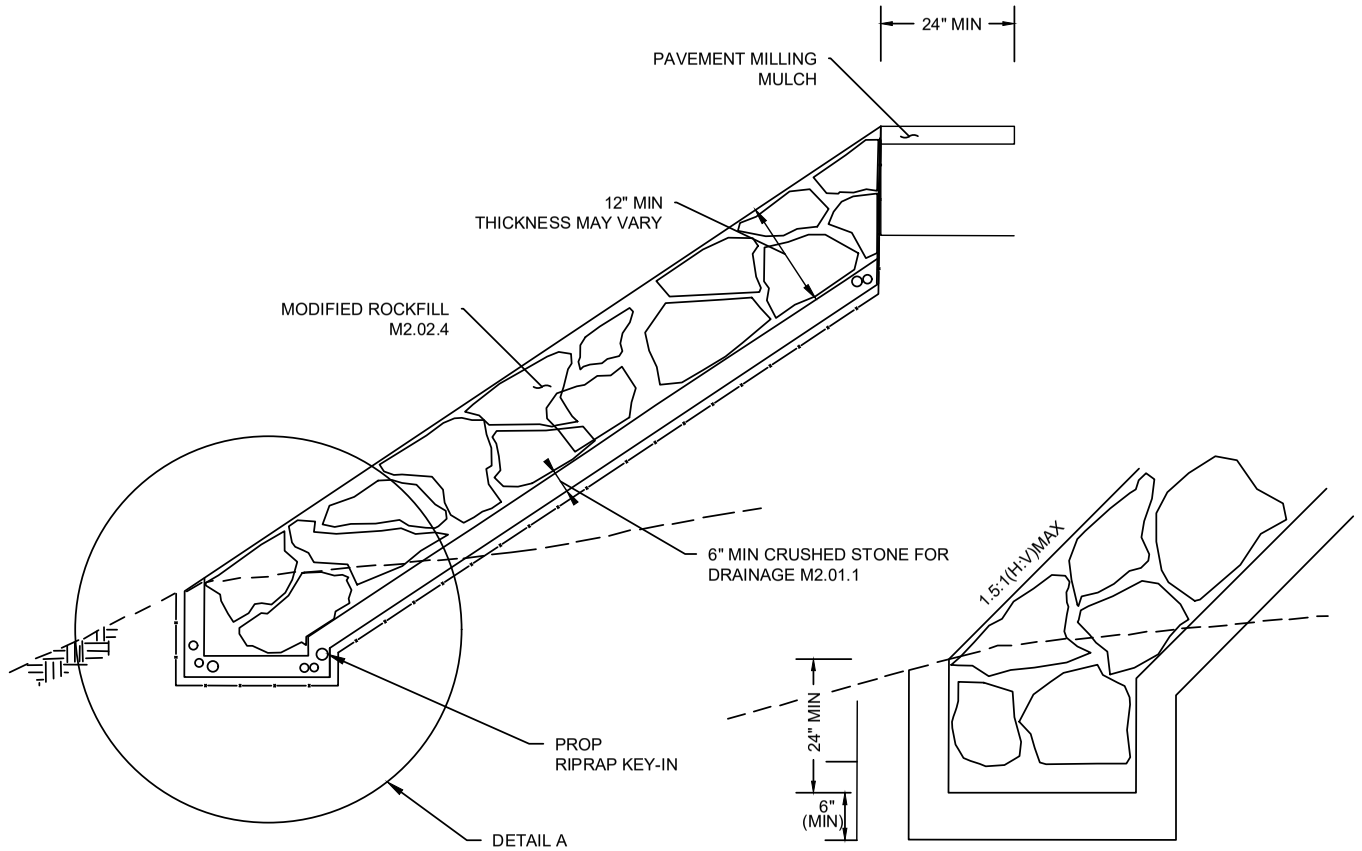


RAILING DETAIL

CEMENT CONCRETE STEPS & HANDRAIL DETAIL
NOT TO SCALE

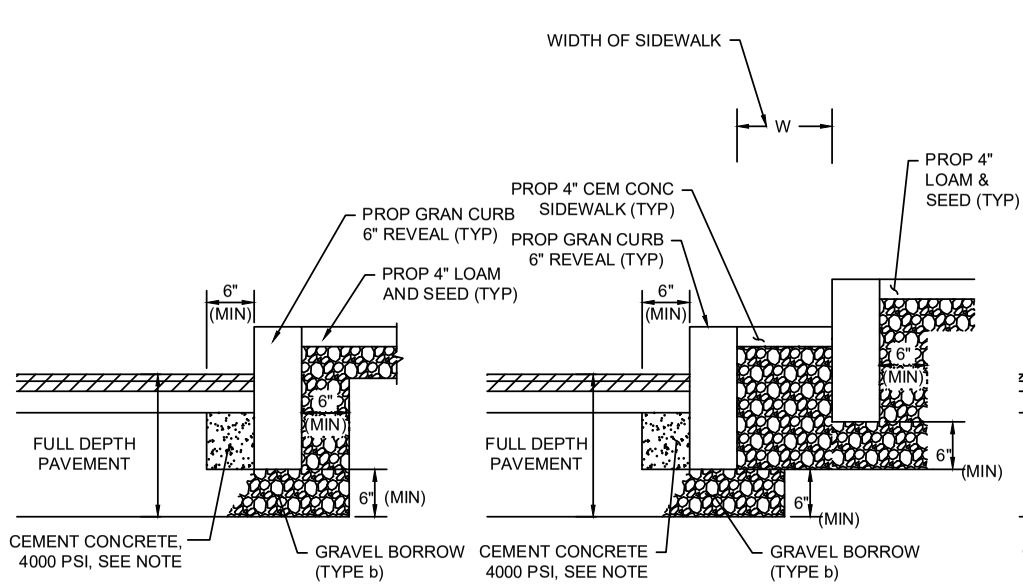
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KEY-IN DETAIL A

MODIFIED ROCKFILL
NOT TO SCALE

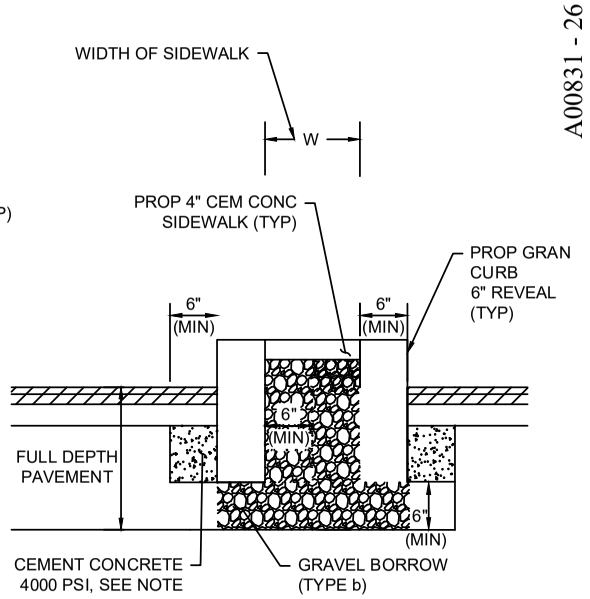


NOTE:
CEMENT CONCRETE SHALL BE PLACED ONLY WHEN CURB IS TO BE SET AFTER BASE COURSE IS PAVED.

GRANITE CURB, TYPE VB,
IN FULL DEPTH PAVEMENT
NOT TO SCALE

NOTE:
CEMENT CONCRETE SHALL BE PLACED ONLY WHEN CURB IS TO BE SET AFTER BASE COURSE IS PAVED.

GRANITE CURB, TYPE VB,
IN FULL DEPTH PAVEMENT &
BACK OF SIDEWALK
NOT TO SCALE



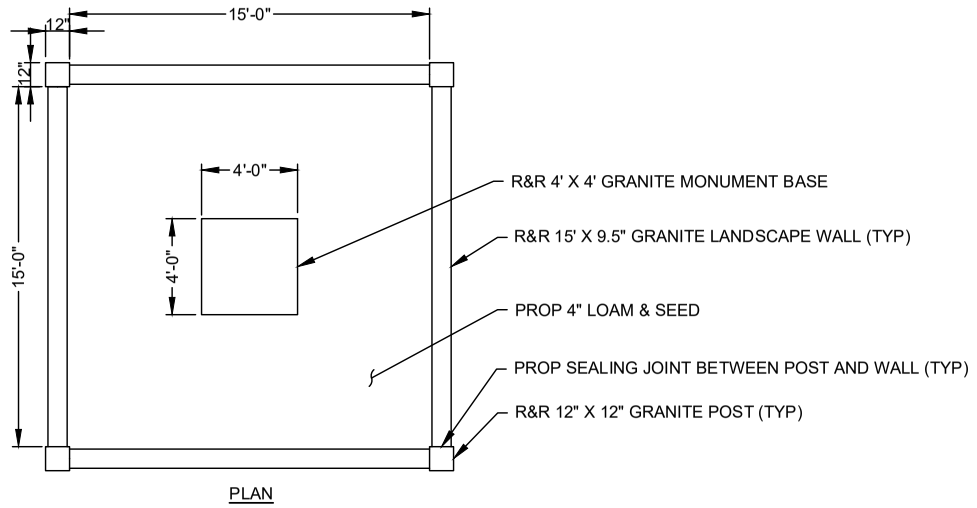
NOTE:
CEMENT CONCRETE SHALL BE PLACED ONLY WHEN CURB IS TO BE SET AFTER BASE COURSE IS PAVED.

GRANITE CURB, TYPE VB,
IN FULL DEPTH PAVEMENT &
BACK OF SIDEWALK WITH
PARKING LOT
NOT TO SCALE

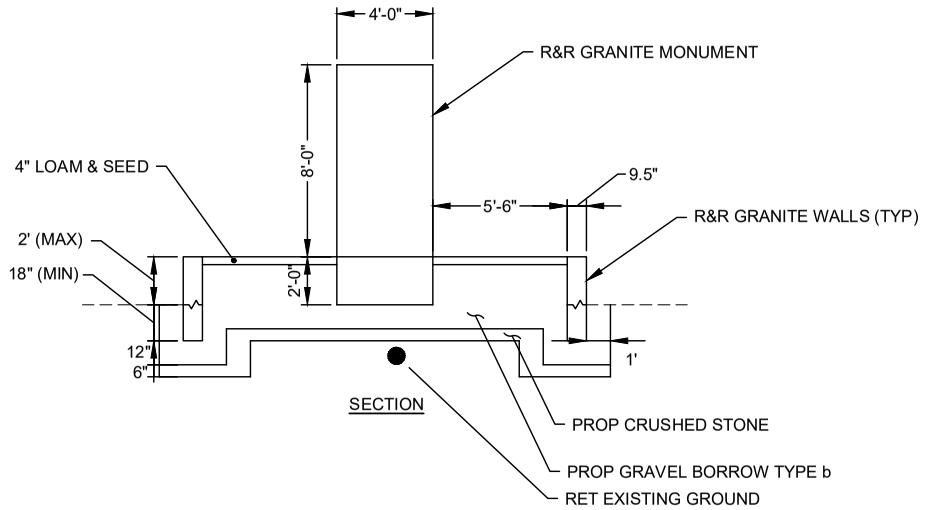
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	20	20
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 4 OF 4



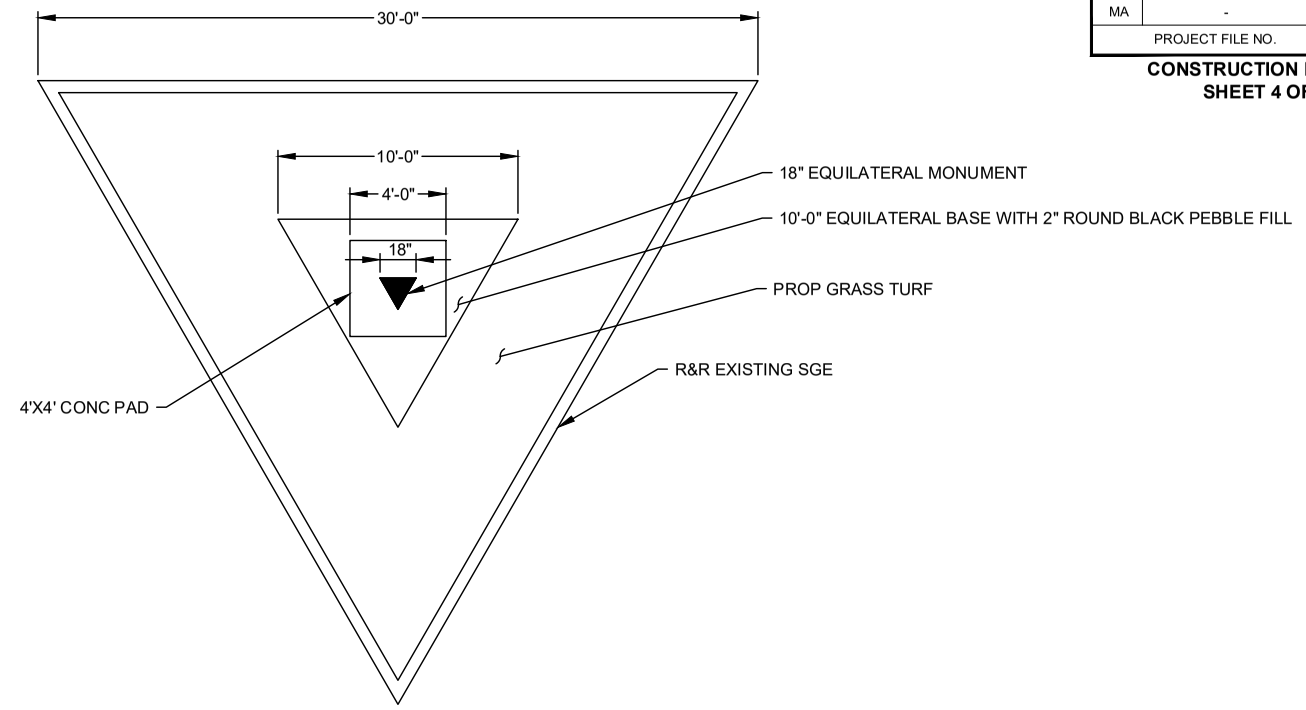
PLAN



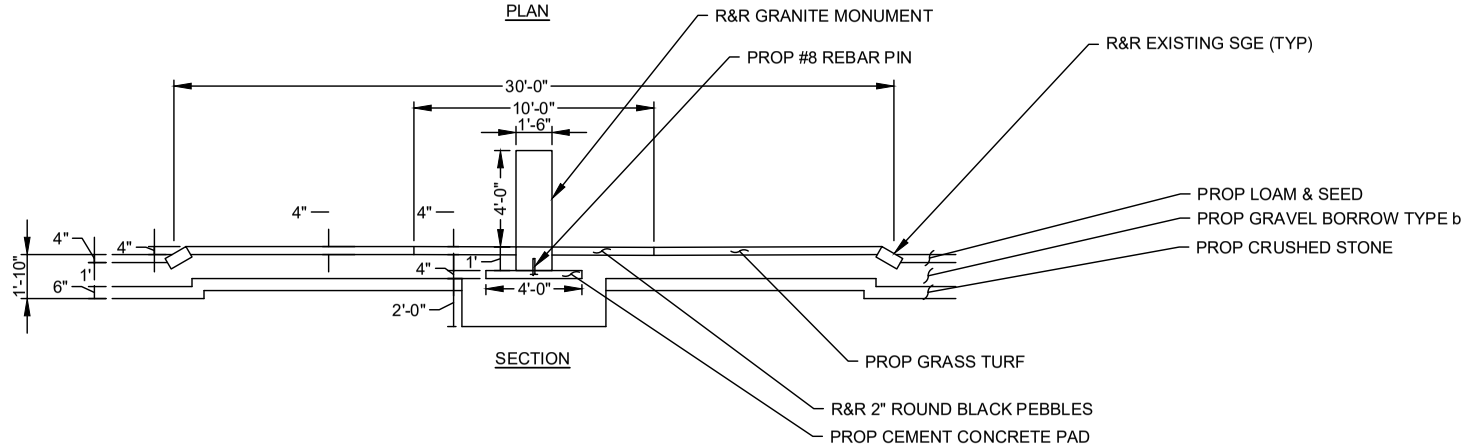
MONUMENT #1
NOT TO SCALE

MONUMENT #1 NOTES:

1. DIMENSIONS FOR MONUMENTS ARE APPROXIMATE AND CONTRACTOR TO RELOCATE MONUMENTS IN KIND.
2. MONUMENT "A" IS TO HAVE ALL WALLS AND POSTS REMOVED AND RESET TO THE NEW LOCATION.
3. COLORED JOINT SEALANT TO BE USED WHERE GRANITE POST AND WALLS JOIN TOGETHER.
4. CONTRACTOR TO PROVIDE ORDINARY BORROW, GRAVEL BORROW, CRUSHED STONE & LOAM AND SEED WHERE NECESSARY FOR BOTH MONUMENTS.
5. CONTRACTOR TO SET THE GRANITE POSTS AND WALLS USING ITEM 901. (4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE).
6. MONUMENT "A" TO BE SET BY CONTRACTOR PRIOR TO POURING OF CONCRETE SURROUNDING PLAZA.



PLAN



MONUMENT #2
NOT TO SCALE

MONUMENT #2 NOTES:

1. DIMENSIONS FOR MONUMENTS ARE APPROXIMATE AND CONTRACTOR TO RELOCATE MONUMENTS IN KIND.
2. EXISTING SLOPED GRANITE EDGING AND LANDSCAPE LIGHTING AT MONUMENT "B" TO BE REMOVED AND RESET AT NEW LOCATION. LIGHTING IS SOLAR POWERED AND NO HARDWIRING IS INCLUDED.
3. MONUMENT "B" TO HAVE NEW OUTDOOR ARTIFICIAL TURF AND BLACK 2" ROUND PEBBLES INSTALLED TO BE REUSED FROM EXISTING MONUMENT.
4. COLORED JOINT SEALANT TO BE USED WHERE GRANITE POST AND WALLS JOIN TOGETHER.
5. CONTRACTOR TO PROVIDE ORDINARY BORROW, GRAVEL BORROW, CRUSHED STONE & LOAM AND SEED WHERE NECESSARY FOR BOTH MONUMENTS.
6. CONTRACTOR TO FORM A NEW CONCRETE PAD (4'X4' & 4" DEPTH) FOR MONUMENT "B" BY USING ITEM 901. (4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE).
7. A #8 BAR TO BE SET IN THE CONCRETE PAD SO THAT THE MONUMENT STRUCTURE CAN REST IN PLACE. NO ADHESIVE IS REQUIRED TO ADHERE THE MONUMENT WITH THE CONCRETE PAD.

Proposal No. 608491-131468

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General Permit No.: NAE-2022-02649 Final Effective Date: June 2, 2023
Applicant: General Public, Commonwealth of Massachusetts Expiration Date: June 1, 2028

Department of the Army
General Permits for the Commonwealth of Massachusetts

The New England District of the U.S. Army Corps of Engineers (USACE) hereby issues twenty-five (25) regional general permits (GPs) for activities subject to USACE jurisdiction in waters of the U.S., including wetlands, navigable waters within the Commonwealth of Massachusetts and adjacent ocean waters to the seaward limit of the outer continental shelf. The Massachusetts GPs (hereafter referred to as the MA GP or GP) are issued in accordance with USACE regulations at 33 CFR 320 – 332 [see 33 CFR 325.5(c)(1)]. These GPs establish criteria and contain permit conditions to ensure that the authorized activities have no more than minimal individual and cumulative adverse impacts to the environment.

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In issuing these GPs, the Federal Government does not assume any liability for the following: (a) damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes; (b) damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the U.S. in the public interest; (c) damages to persons, property or to other permitted or unpermitted activities or structures caused by the activity authorized by any of the GPs; (d) design or construction deficiencies associated with the permitted work; or (e) damage claims associated with any future modification, suspension or revocation of these permits.

Tammy R. Turley 02 June 2023

Tammy R. Turley Date
Chief, Regulatory Division

SECTION I. STATUTORY AUTHORITES & REGULATED ACTIVITIES

1. Work Requiring USACE Authorization

a. Section 10: Work and structures that are located in, over, under or that affect navigable waters of the United States (U.S.) (see 33 CFR 329). The USACE regulates these activities under section 10 of the Rivers and Harbors Act of 1899 (see 33 CFR 322).

b. Section 404: The discharge of dredged or fill material into waters of the U.S (see 33 CFR 328). The USACE regulates these activities under Section 404 of the Clean Water Act (CWA). The term "discharge of dredged or fill material" also includes certain discharges resulting from excavation. Applicants should contact USACE to determine if a particular excavation discharge occurring within waters of the U.S., is a regulated activity. See 33 CFR 323.4 of the CWA for exempted activities.

For additional information on the limits of USACE jurisdiction, please see: https://www.nae.usace.army.mil/Portals/74/docs/regulatory/JurisdictionalLimits/Jurisdictional_Limits_Brochure.pdf

2. Authority to Issue General Permits

a. In accordance with 33 CFR 322.2(f), 325.2(e)(2), and 325.5(c), USACE may issue regional general permits authorizing activities under Section 10 of the RHA.

b. In accordance with Section 404(e) of the CWA, 33 USC 1344(e), and 33 CFR 323.2(h), 325.2(e)(2), and 325.5(c), after notice and opportunity for public hearing, USACE may issue regional general permits for any category of activities involving discharges of dredged or fill material if the activities in such category are similar in nature, will cause only minimal adverse environmental effects when performed separately, and will only have minimal cumulative adverse effect on the environment.

3. Related Laws

33 CFR 320.3 includes a list of related laws including, but not limited to, Section 408 of the Rivers and Harbors Act of 1899, Section 401 of the Clean Water Act, Section 402 of the Clean Water Act, Section 307(c) of the Coastal Zone Management Act of 1972, Section 106 of the National Historic Preservation Act of 1966, Section 7 of the Endangered Species Act, the Fish and Wildlife Coordination Act of 1956, the Magnuson-Stevens Fishery Conservation and Management Act, the Fish and Wildlife Coordination Act, Section 302 of the Marine Protection, Research and Sanctuaries Act of 1972, Section 7(a) of the Wild and Scenic Rivers Act, the Golden Eagle Protection Act, and the Migratory Bird Treaty Act.

SECTION II. REVIEW CATEGORIES & APPLICATION PROCEDURES

To qualify under these GPs, the design, construction, and maintenance associated with each proposed activity must meet the terms and eligibility criteria listed in Section III, all applicable general conditions (GCs) in Section IV, and any specific mitigation requirements in Section V. Applicants should first review the GPs to see if a project is eligible for authorization under one or more of the GPs within this document. Any activity not specifically listed may still be eligible for authorization under these GPs; applicants are advised to contact USACE for specific eligibility determination.

Please note that these GPs allow for Self-Verification (SV) contingent upon meeting all criteria and with full adherence to all GCs. Projects that do not qualify for SV, may meet criteria for Pre-Constriction Notification (PCN). Tables are provided under each activity, which outline criteria for SV and PCN. Activities that do not meet criteria for SV or PCN may require review as an Individual Permit (IP). Activities may require a PCN or IP as noted in Sections III and/or IV of this GP. Notwithstanding compliance with the terms of these GPs, USACE retains discretionary authority to require either PCN review or IP review on a case-by-case basis for any project based on concerns for the environment or for any of the other public interest factors found in 33 CFR 320.4(a). These GPs also do not replace or change those activities identified as exempt from USACE regulation (33 CFR 323.4).

1. Pre-Application Assistance

Prospective applicants may request a pre-application meeting to address any questions they may have. USACE may also request a pre-application meeting or additional information to facilitate review of the request. Pre-application meetings and/or site visits help streamline the authorization process by alerting the prospective applicant to potentially time-consuming factors that may arise during the evaluation of their project (e.g., avoidance, minimization and compensatory mitigation requirements, historic properties, endangered species, essential fish habitat, impacts to federal projects, and/or dredging of contaminated sediments).

To schedule a pre-application meeting, present questions, or if you need further assistance, please contact USACE at:

Email: cenae-r-ma@usace.army.mil (strongly preferred) Phone: (978) 318-8338

Mail: U.S. Army Corps of Engineers
New England District
Regulatory Division, Massachusetts Section
696 Virginia Road
Concord, MA 01742

2. Submitting a Request

Please follow the procedures outlined in Sections II.2-5 when requesting an SV or applying for PCN authorization for activities covered by these GPs. The GPs are provided in Section III below. For SV-eligible projects, the Self-Verification Notification (SVN) must be submitted within 30 days of commencing work. Otherwise, a Pre-Construction Notification (PCN) must be submitted for work that is not SV-eligible. Please include appropriate drawings and attachments and submit your request using the mailbox identified in Section II.4 or II.5 below. USACE will promptly confirm receipt of your request and notify you in the event additional information is required. Guidance on

how to submit electronic correspondence is located on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/Submitting-Electronic-Correspondence.

3. Local, State & Federal Approvals

Applicants are responsible for applying for and obtaining any required local, state, and federal permits or approvals. These must be obtained prior to the commencement of work in waters. Such authorizations may include a Water Quality Certification, a Coastal Zone Management Act consistency determination, and other approvals as noted below. Authorization under these GPs does not obviate the need for the permittee to obtain other Federal, State, or local permits, approvals, or authorizations required by law.

I. Water Quality Certification under Section 401 of the Federal Clean Water Act (33 USC 1341).
Applicants are responsible for determining the appropriate 401 Water quality Certification (WQC) requirements and submitting this information to the USACE at the time of their PCN application or when completing their SVN. Applicants that are unsure of whether their activity has been certified should contact MassDEP, or EPA Region 1 when the activity is located on tribal lands, for a determination. The 401 WQC requirement must be satisfied by acquiring one of the following WQCs from MassDEP (see GC 8):

General 401 WQC: The MassDEP issued a WQC on April 21, 2023 conditionally certifies all activities in GPs 1 – 24 eligible for SV and PCN so long as the activity is described in 314 CMR 9.03, and is not an activity described in 314 CMR 9.04, and so long as the activity meets all other requirements, terms and conditions of this WQC. The MassDEP WQC also conditionally certifies activities described in GP 25 so long as the activity meets all other conditions of the WQC. Emergency projects described in GP 25 must obtain an emergency certification or otherwise be authorized pursuant to 310 CMR 10.06, qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) issued by the MassDEP, or meet the requirements of 9.12(2) or (3) in order to be certified under the WQC

Applicants should refer to the following link to determine if their activity is eligible: *https://www.nae.usace.army.mil/Missions/Regulatory/ State-General-Permits/ Massachusetts-General-Permit/*. If eligible, you must comply with all applicable WQC conditions. Activities listed in 314 CMR 9.03 that are not exempt from the Wetland Protection Act must have a valid Final Order of Conditions (OOC) or Final Restoration Order of Conditions pursuant to 310 CMR 10.00 to be eligible under the General 401 WQC.

Individual 401 WQC: In the event the proposed activity is not covered by the general WQC, applicants shall contact MassDEP and apply for an individual 401 WQC if their activity does not qualify for a General 401 WQC as outlined above. MassDEP may issue, waive, or deny the individual 401 WQC on a case-by-case basis. All activities listed in 314 CMR 9.04 must obtain an individual 401 WQC from MassDEP to be eligible under these GPs. When an Individual 401 WQC is required for *PCN activities*, the applicant shall submit their Individual 401 WQC application concurrently to MassDEP and the USACE to comply with 40 CFR 121.

Activities Proposed on Tribal Lands: When an activity is proposed on Tribal lands, the applicant shall refer to the general 401 WQCs granted by the Environmental Protection Agency (EPA), Region 1 on May 15, 2023. These 401 WQCs are located on the USACE Regulatory website: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

II. Coastal Zone Management Act Federal Consistency Concurrence pursuant to Section 307 of the CZMA of 1972, as amended. Federal consistency concurrence is required for all activities located within the coastal zone, unless determined otherwise by the Massachusetts Office of Coastal Zone Management (MA CZM) (see GC 9). As applicable, this requirement must be satisfied by acquiring one of the following from the MA CZM:

General CZM Federal Consistency Concurrence (General Concurrence): MA CZM has granted General Concurrence for all SV and PCN activities for GPs 1-25 and this can be found at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. The applicant must obtain all applicable permits and approvals prior to the commencement of work in USACE jurisdiction (i.e., construction begins on site). For SVs, General Concurrence is automatically granted and no further action is required from the applicant. For PCNs, the USACE will coordinate with MA CZM to acquire General Concurrence as part of the PCN application review. During review of the PCN application, USACE may request additional information from the applicant to support CZM's evaluation of the activity.

Individual CZM Federal Consistency Concurrence (Individual Concurrence): In certain cases, MA CZM may elevate any GP activity 1-25 to require Individual Concurrence. The applicant must contact MA CZM and follow the procedures to obtain Individual Concurrence as determined appropriate by MA CZM.

The MA CZM program includes five regional offices that serve 78 coastal municipalities. The following map provides more information about these offices: https://www.mass.gov/service-details/czm-regions-coastal-communities-and-coastal-zone-boundary

III. Other Approvals: Approvals typically required in Massachusetts include, but are not limited to, a Chapter 91 Permit/License, Massachusetts Environmental Protection Act (MEPA) review, Wetlands Protection Act Order of Conditions, and/or Aquaculture Certification. *Applicants should also be aware that USACE may not be able to render a permit decision in the event the proposed activity is denied by another local, state and/or federal agency.*

4. Procedures for Self-Verification (SV) Eligible Projects

If the activity is eligible for an SV, the Self-Verification Notification (SVN) must be completed prior to the start of project construction and submitted to USACE within 30 days of commencing work. The purpose of the SVN is to provide applicants with a tool to assist them when determining if the activity as proposed is SV-eligible. The following GPs do not require submission of the SVN: GP 1 (SV #1), GP 3 (SV #2-3), GP 4 (SV #2), GP 11, GP 12 (note #2), GP 14 (see note), GP 15 (see note), and GP 24 (SV #3). **For the activities not listed above, the SVN must be completed prior to the start of work and be kept on site at all times during project construction.** The applicant shall not begin work for SV-eligible activities until they have completely verified the bulleted items below.

Digital submittals by email are **strongly encouraged** to facilitate the most efficient processing of the SVN submittal. Please communicate with USACE staff if you are unable to provide a digital copy. Addresses are cenae-r-ma-sv@usace.army.mil (email) or Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, MA 01742-2751 (mail).

Eligible SV Activities:

- Are subject to USACE jurisdiction (see GC 2); and
- Qualify for one or more of the GPs within this document (Section III); and
- Meet the GCs within this document (Section IV); and

- When required, are supported by a complete SVN (Appendix C); and
- Receive all other required local, State, and/or Federal approvals.

5. Procedures for Pre-Construction Notification (PCN) Eligible Projects

For activities that require a PCN, an application to and written authorization from USACE is required. *No work requiring a PCN may proceed until the applicant receives written authorization from USACE verifying that the activity is authorized.* The verification letter may include special conditions that the applicant must comply with. When possible, it is *highly* recommended that PCN application materials are submitted at least 90 days before the target start date to allow for USACE evaluation and any necessary agency consultations. PCN applications shall demonstrate in writing how the proposed activity complies with all GCs, as applicable to their activity.

Digital submittals by email are **strongly encouraged** to facilitate the most efficient processing of the PCN application. Please communicate with USACE staff if you are unable to provide a digital copy. Addresses are cenae-r-ma@usace.army.mil or Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, MA 01742-2751 (mail).

Eligible PCN Activities:

- Are subject to USACE jurisdiction (see GC 2); and
- Qualify for one or more of the GPs within this document (Section III); and
- Meet the GCs within this document (Section IV); and
- Comply with the Mitigation Standards within this document (Section V); and
- Are supported by a complete PCN document (Appendix B); and
- When required, are supported by the submittal of project information to the appropriate parties identified in Appendix A; and
- Receive all other required local, State, and/or Federal approvals.

6. Interagency Review Procedures

The USACE reserves the opportunity to coordinate PCN activities with Federal and State agencies to ensure that the proposed activity results in no more than a minimal impact to the aquatic environment. In some cases, USACE may require project modifications involving avoidance, minimization, and/or compensatory mitigation for unavoidable impacts to ensure the net effects of a project are minimal. The USACE determines, after review and coordination with the agencies and/or the applicant, if PCN applications:

a. Meet the terms and conditions of the GP as proposed;
b. Require additional information;
c. Require avoidance, minimization, compensatory mitigation, construction sequencing, project modification, or other special conditions to avoid or minimize adverse impacts to the aquatic environment;
d. Require individual permit review regardless of whether the terms and GCs of these GPs are met, based on concerns for the aquatic environment or any other factor of the public interest (see Section 9 below).

For activities requiring a PCN, the applicant must wait for written authorization from USACE before commencing activities in waters of the U.S. Beginning work for PCN required activities without a USACE written authorization is a violation of these GPs, and the terms and conditions of this document. The applicant may be subjected to an enforcement action by USACE and/or the Environmental Protection Agency (EPA).

7. Construction of Solid Fill Structures and Fills Along the Coastline or Baseline from Which the Territorial Sea is Measured.

Projects involving the construction of solid fill structures or discharge of fill that may extend beyond the coastline or the baseline from which the territorial sea is measured (i.e., mean low water) will require a PCN. The USACE will submit a description of the proposed work and a copy of the plans to the Solicitor, Department of the Interior, Washington, DC 20240, and request comments concerning the effects of the proposed work on the outer continental rights of the United States. These comments will be included in the administrative record of the application. After completion of permit review, the record will be forwarded to the Chief of Engineers. The decision on the application will be made by the Secretary of the Army after coordination with the Attorney General.

8. Emergency Activities

Per 33 CFR 325.2(e)(4), an emergency is limited to a situation that would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship if corrective action requiring a permit is not undertaken within a time period less than the normal time needed to process an application under standard procedures. Emergency work shall be limited to that which is necessary to stabilize and secure the situation. Additional work needed for final repairs shall not be completed until approval is obtained through the appropriate, non-emergency process. Emergency work is subject to the same terms and conditions of these GPs as non-emergency work, and similarly, must qualify for authorization under these GPs; otherwise, an IP is required. *See GP 25 Emergency Situations for additional information.*

9. Individual Permit

Projects that do not meet the terms and conditions of this GP may require review as an IP (33 CFR 325.5 (b)). Proposed work in this category will require a separate Federal application for an individual permit from USACE (33 CFR 325.1). In addition, USACE retains discretionary authority on a case-by-case basis to elevate GP-eligible activities to an IP based on concerns for the environment or any other factor of the public interest (33 CFR 320.4 (a)). Applicants are required to submit the appropriate application materials directly to USACE as early as possible to expedite the permit review process. General information and application forms can be obtained at our website or by contacting our office at cenae-r-ma@usace.army.mil or (978) 318-8338. Individual 401 WQC and/or CZMA Federal consistency concurrence from the appropriate MA agencies are required before USACE can issue an individual permit. Applying for an IP does not relieve the applicant from their obligation to obtain all required Federal, State and/or local approvals.

10. Compliance

Applicants shall ensure compliance with all applicable GPs in Section III, GCs in Section IV, and any special conditions included in USACE verification letters. Noncompliance with these GPs, GCs, and special conditions may subject the applicant to criminal, civil, or administrative penalties, and/or an ordered restoration, and/or the permit may be modified, suspended or revoked by USACE. The USACE will consider any activity requiring USACE authorization to be noncompliant if that activity does not comply with all GP terms and conditions at all times, including while the project is under construction and when work is completed.

SECTION III. MASSACHUSETTS GENERAL PERMITS

Applicants are encouraged to review Sections I & II prior to submitting an application to confirm that the activity as proposed complies with all terms and conditions of the 2023 MA GPs. Applicants are also encouraged to review the definitions in Section VII, Definitions & Acronyms, of this document. Several terms are frequently used throughout the GPs, and it is important for the reader to understand these terms. If seeking verification for an activity previously verified under the 2018 MA GPs, please contact the USACE to discuss permitting needs in advance of submitting an application.

General Permits

1. Aids to Navigation and Temporary Recreational Structures
2. Maintenance
3. Moorings
4. Structures in Navigable Waters of the U.S.
5. Boat Ramps and Marine Railways
6. Utility Lines, Oil or Natural Gas Pipelines, Outfall Or Intake Structures, and Appurtenant Features
7. Dredging, Disposal of Dredged Material, Beach Nourishment, Rock Removal and Rock Relocation
8. U.S. Coast Guard Approved Bridges
9. Bank and Shoreline Stabilization
10. Aquatic Habitat Restoration, Enhancement, and Establishment Activities
11. Fish and Wildlife Harvesting and Attraction Devices and Activities
12. Response Operations, Oil and Hazardous Substances
13. Cleanup of Hazardous and Toxic Waste
14. Scientific Measurement Devices
15. Survey Activities
16. Land and Water-Based Renewable Energy Generation Facilities and Hydropower Projects
17. Residential, Commercial and Institutional Developments, and Recreational Facilities
18. Aquaculture
19. Mining Activities
20. Living Shorelines
21. Agricultural Activities
22. Reshaping Existing Drainage Ditches, Construction of New Ditches, and Mosquito Management
23. Linear Transportation Projects and Wetland/Stream Crossings
24. Temporary Construction, Access, and Dewatering
25. Emergency Situations

GP 1. AIDS TO NAVIGATION AND TEMPORARY RECREATIONAL STRUCTURES (Authority: §10)	
(a) The placement of aids to navigation and regulatory markers that are approved by and installed in accordance with the requirements of the U.S. Coast Guard (USCG). See 33 CFR, Part 66; and (b) Temporary buoys, markers, and similar structures placed for recreational use during specific events such as water skiing competitions and boat races or seasonal use. See GC 16.	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. Aids to navigation and regulatory markers approved by and installed in accordance with the requirements of the USCG. 2. Temporary buoys, markers and similar structures that are: (a) placed for recreational use during specific events and removed within 30 days after event; or (b) placed during winter events on ice and removed before spring thaw. These structures must be authorized by the local harbormaster, not located within an FNP or its buffer zone, and not located in saltmarsh or tidal vegetated shallows.	1. Impacts in saltmarsh or tidal vegetated shallows. 2. Activities that are not SV eligible.
Note: An SVN submittal to USACE is not required for work authorized under SV #1 above.	

GP 2. MAINTENANCE (Authorities: §10 and §404)

Repair, rehabilitation, or replacement of any previously authorized[1], currently serviceable structure, or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3 (activities occurring before certain dates), provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction technique requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the activities above. Maintenance dredging and beach nourishment are not eligible under GP 2 (see GP 7). Stream crossing modifications (including sliplining), replacements or extensions are not eligible under GP 2 (see GPs 6, 17, 23). *See GP 25 Emergency Situations for expedited review of emergency activities.*

Not authorized under GP 2 (IP required): (a) Permanent impacts in >1 acre in non-tidal waters and/or wetlands; or (b) Permanent impacts >1/2 acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; or (c) Temporary impacts >1 acre in tidal waters; >5000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >1000 SF in vegetated shallows; (d) New stream channelization or stream relocation projects (e.g., those in response to storm or flood events).

Self-Verification Eligible

Maintenance activities that meet all of the following terms:

1. In non-tidal waters, the combined permanent and temporary impacts extending beyond the original footprint are ≤5,000 SF[2] and not located in vegetated shallows or riffle and pool complexes.

2. In tidal waters, the combined permanent and temporary impacts extending beyond the original footprint are ≤5,000 SF, ≤1,000 SF in mudflats and/or natural rocky habitat, and not located in saltmarsh and tidal vegetated shallows.

3. Minor deviations in the repair, rehabilitation, or replacement of previously authorized, currently serviceable structures or fills.

4. Bulkhead replacement in tidal and non-tidal waters via installation of new bulkhead within 18 inches of the existing bulkhead and associated backfill.

5. Drawdown of an impoundment for dam/levee repair provided it does not exceed 18 months and one growing season (April through September).

Pre-Construction Notification Required

1. Discharges associated with removal of accumulated sediments and debris in the vicinity of existing structures, including intake and outfall structures and associated canals.

2. The removal of sediment outside the immediate vicinity of existing structures (e.g., bridges, culverted road crossings, water intake structures, etc.) that is ≥200 linear feet. This activity is limited to the minimum necessary to restore the waterway in the vicinity of the structure to the approximate dimensions existing when the structure was built.

3. Dam and flood control or levee repair, rehabilitation, or replacement involves:
   a. A change in the flood elevation or permanent water surface elevation of the impoundment; or
   b. Drawdown of impoundment for construction exceeding one growing season (see SV eligible #5);
   c. Any modification that changes the character, scope, or size of the original fill design; or
   d. Does not meet SV eligible 1-7.

4. Installation of steel piles, including steel sheet piles, that cannot be done in the dry and where NOAA-ESA listed species are mapped as present.

[1] Some maintenance activities may not be subject to regulation under Section 404 of the CWA in accordance with 33 CFR 323.4(a)(2). Per 33 CFR 330.3, Vested dates are: a) Work performed and structures installed before December 18, 1968 (Section 10); and b) Fill placed before July 25, 1975 (Section 404).
[2] This excludes dam projects that may require a temporary drawdown with impacts >5,000 SF in non-tidal waters. Instead, the drawdown shall comply with SV #5 to be eligible under Self-Verification.

6. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications, including the removal of material from the stream channel, must be immediately adjacent to the project or within the boundaries of the structure or fill. 7. Work to previously approved tide gates not affecting upstream tidal resource areas.	5. Activities located in the Connecticut River or Merrimack River, unless they are completed in the dry or when the tide is waterward of the work area. 6. Activities on USACE properties & USACE-controlled easements. 7. Activities that do not require an IP. Activities that do not require a PCN or an IP may be SV eligible.
Notes: 1. This authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the CWA §404(f) exemption for maintenance. See 33 CFR 323.4(a)(2). Prior USACE permits may have included authorization to maintain the activity, in which case authorization under this GP is not necessary. 2. See GC 22 for information on temporary construction mats.	

GP 3. MOORINGS (Authority: §10)

New moorings and mooring fields; the relocation of previously authorized moorings; expansions, boundary reconfigurations or modifications of previously authorized mooring fields; and maintenance and replacement of moorings.

Not authorized under GP 3 (IP required): (a) Moorings or mooring fields converted to or associated with a new boating facility[1]; or (b) Moorings in a USACE Federal Navigation Anchorage or USACE Federal Navigation Channel, except municipal-operated mooring fields.

Self-Verification Eligible	Pre-Construction Notification Required
1. New or relocated moorings that meet all the following terms: a. Authorized by a local harbormaster/ municipality under MGL Chapter 91 §10A; and b. No interference with navigation; and c. Single boat, single-point and non-commercial; and d. Not associated with a boating facility, and e. Neither placed within nor impact tidal vegetated shallows (e.g., eelgrass); and f. Not located within a USACE Federal navigation project (FNP) or the FNP buffer zone. 2. Existing, authorized moorings are converted from traditional moorings to low impact mooring technology (see note below) and/or helical anchors. 3. Maintenance and replacement of moorings authorized by the USACE.	1. New mooring fields; or expansions, boundary reconfigurations or modifications of existing, authorized mooring fields. 2. Moorings located such that they, and/or vessels docked or moored at them, are within the buffer zone of the horizontal limits of a Federal Anchorage. The buffer zone is equal to 3 times the authorized depth of that channel (see GC 15). 3. New individual moorings located in saltmarsh, mudflats, natural rocky habitat, and tidal vegetated shallows. Locating moorings these areas should be avoided to the maximum extent practicable. If these areas cannot be avoided, plans should show conservation mooring or low-impact mooring systems that prevent mooring chains from resting or dragging on the bottom substrate at all tides, where practicable. USACE may require a survey in areas previously mapped as containing eelgrass or within 100 ft. of existing eelgrass beds to document presence or absence of eelgrass and to determine the appropriate type and amount of compensatory mitigation for impacts to eelgrass. 4. Replacement moorings located in tidal vegetated shallows. 5. Moorings that are not SV eligible and do not require an IP.

Notes:

1. Low impact mooring systems, including conservation moorings, are encouraged to minimize impacts of chain scouring from conventional moorings during the tidal cycle.
2. An SVN submittal to USACE is not required for work authorized under SV #2-3 above.

[1] Boating facilities are marinas, yacht clubs, boat clubs, boat yards, dockominiums, town facilities, land/homeowner's associations, etc. that provide for a fee, rent or sell mooring or docking space. Not classified as boating facilities are municipal moorings or municipal mooring fields that charge an equitable user fee based only on the actual costs incurred.

GP 4. STRUCTURES IN NAVIGABLE WATERS OF THE U.S. (Authority: §10 & §404)

New, expansions, reconfigurations or modifications of structures for navigational access in waters of the U.S. including but not limited to temporary/seasonal or permanent pile and pole-supported piers, floats, stairs, shore outhauls, and boat and float lifts.

Not authorized under GP 4 (IP required): (a) Structures associated with a new boating facility; (b) Structures in a USACE Federal anchorage or channel; or (c) Artificial reefs.

Self-Verification Eligible

1. Private, non-commercial piers, floats and lifts that meet all the following terms:

a. Piers and floats in: (i) Tidal waters total ≤600 SF combined; and (ii) Non-tidal navigable waters of the U.S. total ≤600 SF combined; and

b. Piers are ≤4 feet wide and ≥6 feet above the marsh substrate (the height is measured from the marsh substrate to the bottom of the lowest longitudinal support); and

c. Floats and lifts in tidal waters and non-tidal navigable waters of the U.S. are ≥24 inches above the substrate during all tidal cycles. Float stops are preferred when site conditions warrant them (i.e., low tide exposes substrate), and skids can only be used in areas where piles are not feasible and on sandy or hard bottom substrates; and

d. Piers, floats and lifts: (i) Are ≥25 feet from previously mapped or existing vegetated shallows, or riparian property line extensions; (ii) Extend ≤25% of the waterway width in non-tidal navigable waters of the U.S. or MHW in tidal navigable waters of the U.S.

e. Installation of ≤12-inch diameter timber piles. Installation of ≥12-inch diameter piles of any material type when installed in the dry.

2. Fenders and similar structures.

Pre-Construction Notification Required

1. Shore outhauls.
2. Expansions, modifications, or new reconfiguration zones at any authorized boating facility.
3. New, expansions, reconfigurations, reconfiguration zones, or modifications of structures that provide public, community or government recreational uses such as boating, fishing, swimming, access, etc.
4. Installation of steel piles, including steel sheet piles, that cannot be done in the dry and where NOAA-ESA listed species are mapped as present.
5. Located within the buffer zone of the horizontal limits of an FNP (GC 15).
6. Miscellaneous structures.
7. Impacts in tidal vegetated shallows.
8. Structures that are not SV eligible and do not require an IP.

Notes:

1. See GC 19 regarding pile driving and pile removal in navigable waters and
2. See GC 20 regarding time of year restrictions in tidal waters.
3. Boating facilities are facilities that provide for a fee, rent, or sell mooring space, such as marinas, yacht clubs, boat clubs, boat yards, town facilities, dockominiums, etc. Pile supported structures with no discharges of dredged or fill material are not regulated by USACE in non-navigable waters.
4. A SVN submittal to USACE is not required for SV #2 above.

GP 5. BOAT RAMPS AND MARINE RAILWAYS (Authorities: §10 and §404)

Activities required for the construction of boat ramps and marine railways, including excavation and fill.

Not authorized under GP 5 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters of the U.S., >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows[1]; or (c) dredging in navigable waters of the U.S. (see GP 7).

Self-Verification Eligible	Pre-Construction Notification Required
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. Boat ramps are located within 25 feet of property line extensions unless the properties are owned by the same owner. The USACE may require a letter of no objection from the abutter(s).
2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, and (c), not located in saltmarsh and tidal vegetated shallows.	2. Activities that are not eligible for SV and do not require an IP.

GP 6. UTILITY LINES, OIL OR NATURAL GAS PIPELINES, OUTFALL OR INTAKE STRUCTURES, AND APPURTENANT FEATURES (Authorities: §10 & §404)

Activities required for: (a) The construction, maintenance, repair or removal of utility lines, oil or natural gas pipelines[1], outfall or intake structures[2], and appurtenant features including the associated excavation, backfill, or bedding for these structures. (b) The construction, maintenance, or expansion of substations and other appurtenant facilities associated with a utility line, oil or natural gas pipeline, and outfall or intake structure in non-tidal waters of the U.S.; and (c) The construction and maintenance of foundations for overhead utility line towers, poles, and anchors in tidal and non-tidal waters of the U.S., provided the foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) are used where feasible. This GP authorizes the construction of access roads to facilitate construction of the above activities provided the activity, in combination with all other activities included in one single and complete project, does not exceed the thresholds identified below (IP required). Access roads used solely for construction of the utility line must be removed upon completion of the work. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the activities above.[3]

Not authorized under GP 6 (IP required): (a) Permanent impacts for any single and complete project that are >1 acre in non-tidal waters of the U.S.; >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Stormwater treatment or detention systems, or subsurface sewage disposal systems in waters of the U.S.; or (d) New tide gates that do not meet SV criteria below.

Self-Verification Eligible	Pre-Construction Notification Required
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, and (c), not located in saltmarsh and tidal vegetated shallows. 3. Intake structures that are dry hydrants used exclusively for firefighting activities with no stream impoundments. 4. New tide gates on outfall structures for pipes conveying stormwater and/or industrial NPDES-permitted discharges from waters that are not waters of the U.S.	1. New outfall and/or intake structures. 2. Unconfined work or silt producing activities in streams with diadromous fish. 3. Submarine cables, conduits, or pipelines that occur in, over or under navigable waters of the U.S. 4. Stream channelization, relocation, impoundment, or loss of streambed occurs. 5. The activity is placed within and runs parallel to or along a streambed within waters of the U.S. 6. There is a permanent change in preconstruction contours in waters of the U.S. 7. Installation of utility lines or gas/oil pipelines using trench excavation where material is temporarily sidecast into waters of the U.S. for >3 months. Applicants must demonstrate how the material would not be dispersed by currents or other forces. 8. Activities that are not SV eligible and do not require an IP.

[1] See the definitions of a “utility line” and “oil or natural gas pipeline” in Section VII.
[2] Outfall structures must be in compliance with regulations issued under the National Pollutant Discharge Elimination System Program (Section 402 of the Clean Water Act).
[3] Temporary impacts shall comply with all GCs, including GC 32 Utility Line Installation and Removal.

GP 7. DREDGING (Authority: §10), DISPOSAL OF DREDGED MATERIAL (Authorities: §10, §404), BEACH NOURISHMENT (Authorities: §10 & §404), ROCK REMOVAL (Authority: §10) AND ROCK RELOCATION (Authorities: §10 & §404)

New, improvement and maintenance dredging (see notes below) including: (a) Disposal of dredged material at a confined aquatic disposal cell, beach nourishment location, near shore site, or ocean disposal site selected under Section 404 of the Clean Water Act pursuant to the 404(b)(1) Guidelines, provided the dredged material meets the requirements for such disposal; (b) Beach nourishment not associated with dredging; and (c) Rock removal and relocation for navigation.

Not authorized under GP 7 (IP required): (a) Dredging where ocean disposal is required for the disposal of dredged material (Section 103); New dredging >½ acre; ≥10,000 CY; >1000 SF permanent impacts to intertidal areas, saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF permanent impacts to tidal vegetated shallows; (b) Maintenance or improvement dredging and/or disposal with >1 acre of impacts to intertidal areas, saltmarsh, mudflats, riffle and pool complexes, or non-tidal vegetated shallows; (c) New dredging where the primary purpose is sand mining for beach nourishment; (d) Beach scraping; (e) Boulder removal and relocation for navigation >½ acre; or (f) Blasting.

Self-Verification Eligible

1. Maintenance dredging of previously dredged areas, with upland disposal, that meet all of the following terms:
   a. Dredged area ≤1/2 acre; and
   b. Activities comply with GC 20, TOY Restrictions. The time-of-year restriction(s) stated in Appendix B of the MA Division of Marine Fisheries (DMF) Technical Report TR-47[1] can apply instead if the general TOY restriction if a TOY is provided for a specific waterbody and is less restrictive. This is to protect endangered species, EFH, and other species; and
   c. The dredge footprint is located >25' from salt marsh or >100' from vegetated shallows; and
   d. Combined permanent and temporary impacts that are (i) ≤1,000 SF in mudflats or natural rocky habitat, or (ii) ≤5,000 SF within intertidal habitat and areas containing shellfish (an area contains shellfish unless: it is verified that minimal shellfish are present per the local shellfish constable or a shellfish survey; or it is not mapped as a MassGIS shellfish suitability area).
   e. No return water from upland disposal areas.

2. Boulder relocation with ≤1,000 SF of impacts, relocated to a similar depth and substrate.

Pre-Construction Notification Required

1. Maintenance dredging where the primary purpose is sand mining for beach nourishment.

2. New dredging and associated disposal ≤1/2 acre or <10,000 cubic yards.

3. Improvement dredging.

4. Beach nourishment in waters of the U.S. not associated with dredging.

5. Activities that are located in saltmarsh and tidal vegetated shallows.

6. Dredging in a Federal Navigation Project or within the buffer zone (see GC 15).

7. Activities that are not eligible for SV and do not require an IP.

Notes:

1. See Section VII for definitions of improvement and maintenance dredging.
2. For PCN activities, the USACE may waive or adjust the time of year requirement on a case-by-case basis after consultation with resource agencies.
3. Disposal site of any dredged material must be identified prior to obtaining USACE authorization.
4. Contact the USACE if a ten-year authorization to maintain an area is desired.

[1] The MA DMF Technical Report TR-47: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/

GP 8. U.S. COAST GUARD APPROVED BRIDGES (Authorities: §404)

Discharges of dredged or fill material incidental to the construction and modification of bridges across navigable waters of the U.S., including cofferdams, abutments, foundation seals, piers, and temporary construction and access fills provided that the USCG authorizes the construction of the bridge structure under Section 9 of the Rivers and Harbors Act of 1899 or other applicable laws. A USCG Authorization Act Exemption or a Surface Transportation and Uniform Relocation Assistance Act (STURRA) (144h) exemption do not constitute USCG authorization.

Not authorized under GP 8 (IP Required): Causeways and approach fills (see GP 23).

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Discharges of dredged or fill material that are incidental to the construction of bridges across navigable waters and meet all of the following: a. Combined permanent and temporary impacts that are ≤5,000 SF. b. Combined permanent and temporary impacts that are ≤1,000 SF in mudflats and natural rocky habitat. c. Not located in saltmarsh and tidal vegetated shallows.	1. Activities on USACE properties & USACE controlled easements.2. Installation of steel piles, including steel sheet piles, that cannot be done in the dry and where NOAA-ESA listed species are mapped as present. 3. Activities that are not eligible for SV and do not require an IP.

Notes:

1. GP 8 is not applicable to bridges over inland waters or wetlands that are not tidally influenced or regulated as navigable under Section 10.
2. See eligibility criteria for GPs 2 & 23 for projects that are not subject to USCG regulations.

GP 9. BANK AND SHORELINE STABILIZATION (Authorities: §10 & §404)

Bank stabilization activities necessary for erosion protection along the banks of lakes, ponds, streams, estuarine and ocean waters, and any other open waters. Includes bulkheads, seawalls, riprap, revetments, living seawalls, or slope protection & similar structures, specifically for the purpose of shoreline protection. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the activities above.

Activities must meet the following criteria: (a) No material is placed in excess of the minimum needed for erosion protection; (b) No material is of a type, or is placed in any location, or in any manner, that will impair surface water flow into or out of any waters of the U.S.; (c) No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas); (d) Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization; (e) The activity is not a stream channelization activity; and (f) The activity must be properly maintained, which may require repairing it after severe storms or erosion events. This GP authorizes those maintenance and repair activities if they require authorization. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to construct the bank stabilization activity. See GP 20 for living shoreline stabilization structures or fills.

Not authorized under GP 9 (IP required): (a) New bank stabilization >500 feet in total length (>1,000 linear feet in total length when necessary to protect transportation infrastructure) or permanent loss of saltmarsh >1,000 SF, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects (an exception is for bulkheads – the district engineer cannot issue a waiver for a new bulkhead that is >1,000 feet in length along the bank); (b) Stream channelization or relocation activities; or (c) Breakwaters, groins or jetties.

Self-Verification Eligible

1. Activities in tidal and non-tidal waters that are:
   a. <200 feet in length.
   b. <400 feet in length when necessary to protect transportation infrastructure.
   c. ≤1 cubic yard of fill per linear foot average along the bank waterward of the plane of OHW or HTL.
   d. Not located in non-tidal wetlands, saltmarsh, vegetated shallows.

Pre-Construction Notification Required

1. Activities in tidal and non-tidal waters that are:
   a. ≥200 feet to ≤500 feet in total length. Activities >500 feet in total length must have a written waiver from USACE.
   b. ≥400 feet to ≤1,000 feet in total length when necessary to protect transportation infrastructure. Activities >1,000 feet in total length must have a written waiver from USACE.
   c. >1 cubic yard of fill per linear foot average along the bank waterward of the plane of OHW or HTL.
   d. Located in non-tidal wetlands, saltmarsh, vegetated shallows.
2. Activities with permanent loss of tidal or non-tidal waters that is (a) ≥5,000 SF or (b) ≥1,000 SF in mudflats and natural rocky habitat.
3. Activities that are (a) located in the Connecticut River or Merrimack River and/or (b) require installation of steel piles/steel sheet piles that cannot be done in the dry where NOAA ESA-listed species are mapped as present.
4. Activities on USACE properties & USACE-controlled easements.
5. Activities that require grouted riprap and/or poured/unformed concrete.
6. Activities that are not eligible for SV and do not require an IP.

Note: The applicant shall comply with GC 24. This includes utilization of bioengineering techniques in lieu of hard armoring to the maximum extent practicable as site conditions allow.

GP 10. AQUATIC HABITAT RESTORATION, ENHANCEMENT, AND ESTABLISHMENT ACTIVITIES (Authorities: §10 and §404)

Activities for the restoration, enhancement and establishment of non-tidal and tidal wetlands and riparian areas, including invasive, non-native or nuisance species control; the restoration and enhancement of non-tidal streams and other non-tidal open waters; the relocation of non-tidal waters, including non-tidal streams & associated wetlands for reestablishment of a natural stream morphology and reconnection of the floodplain; the restoration and enhancement of shellfish, finfish and wildlife; and the rehabilitation or enhancement of tidal streams, tidal wetlands and tidal open waters; provided those activities result in net increases in aquatic resource functions and services. See GP 9 for bank and shoreline stabilization. See GP 20 for living shorelines.

Not authorized under GP 10 (IP required): Stream channelization activities and artificial reefs.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In tidal and non-tidal waters excluding tidal vegetated shallows, the combined permanent and temporary impacts are ≤5,000 SF. 2. Eelgrass (vegetated shallows) planting and transplanting ≤100 SF in tidal waters.	1. In tidal and non-tidal waters excluding tidal vegetated shallows, the combined permanent and temporary impacts are >5,000 SF. 2. Eelgrass (vegetated shallows) planting and transplanting >100 SF in tidal waters. 3. Permanent water impoundments, dam removal, fish ladders, or tide gates. 4. Stream relocation, impoundment, or loss of streambed occurs. 5. Runneling projects with the purpose of restoring saltmarsh by removing excess water that ponds on the saltmarsh surface. 6. The conversion of: (a) a stream or natural wetlands to another aquatic habitat type (e.g., stream to wetland or vice versa, wetland to pond, etc.) or uplands, (b) one wetland type to another (e.g., forested wetland to an emergent wetland). 7. Activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, or Merrimack River from the Essex Dam to the mouth, involving permanent or temporary impacts unless they are performed <5 feet waterward from OHW or HTL and in the dry. This is to protect endangered species. 8. Activities on USACE properties & USACE-controlled easements. 9. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Changes in wetland plant communities that occur when wetland hydrology is more fully restored during wetland rehabilitation activities are not considered a conversion to another aquatic habitat type.
2. See RGL 18-01 for guidance on removal of obsolete dams and other structures from rivers and streams. https://www.usace.army.mil/missions/civil-works/regulatory-program-and-permits/guidance-letters/
3. An ecological reference site may be used for a design basis of the restoration activity. The reference site should possess characteristics of an intact aquatic habitat or riparian area that exists in the region. The reference site shall represent the target habitat type of the proposed activity. A reference site may be required at the discretion of USACE.

GP 11. FISH AND WILDLIFE HARVESTING AND ATTRACTION DEVICES AND ACTIVITIES (Authorities: §10 and §404)

Fish and wildlife harvesting and attraction devices and activities in waters of the U.S. such as pound nets, crab traps, crab and shellfish dredging, eel pots, lobster traps, duck blinds, clam and oyster digging, fish aggregating devices, and small fish attraction devices such as open-water fish concentrators (sea kites, etc.).

Not authorized under GP 11 (IP required): Artificial reefs; or new, or expansions of, impoundments and semi-impoundments of waters of the U.S. for the culture or holding of motile species such as lobster with an impounded area >½ acre.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤1/2 acre, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. Fish and wildlife harvesting and attraction devices and activities that do not require a PCN or IP.	1. Pound nets, impoundments or semi-impoundments of waters of the U.S. for the culture or holding of motile species such as lobster with an impounded area ≤½ acre, fish aggregating devices, or small fish attraction devices. 2. Devices and activities that are located in tidal vegetated shallows, mud flats, or saltmarsh. 3. Devices and activities that do not require an IP.

Note: An SVN submittal to USACE is not required for work authorized under GP 11.

GP 12. RESPONSE OPERATIONS, OIL AND HAZARDOUS SUBSTANCES (Authorities: §10 & §404)

(a) Activities conducted in response to a discharge or release of oil and hazardous substances that are subject to the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300) including containment, cleanup, and mitigation efforts, provided that the activities are done under either: (i) The Spill Prevention, Control and Countermeasure Plan required by 40 CFR 112.3; (ii) The direction or oversight of the Federal on-scene coordinator designated by 40 CFR 300; or (iii) Any approved existing State, regional or local contingency plan provided that the Regional Response Team concurs with the proposed response efforts or does not object to the response effort; (b) Activities required for the cleanup of oil releases in waters of the U.S. from electrical equipment that are governed by EPA's polychlorinated biphenyl (PCB) spill response regulations at 40 CFR 761; (c) Booms placed in navigable waters of the U.S. for oil and hazardous substance containment, absorption and prevention; and (d) The use of structures and fills for spill response training exercises. Wetlands, vegetated shallows, mudflats, and riffle and pool complexes should be restored in place at the same elevation.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Activities are conducted in accordance with (a) or (b) above that are not planned or scheduled, but an emergency response (see Note 1). 2. Booms placed in navigable waters of the U.S. for oil and hazardous substance containment, absorption and prevention. 3. Temporary impacts for spill response training exercises ≤5000 SF in non-tidal waters and ≤1000 SF in tidal waters with no impacts to wetlands, saltmarsh, mudflats, or vegetated shallows. 4. Temporary structures in tidal waters with no impacts to wetlands, saltmarsh, mudflats, vegetated shallows, or riffle and pool complexes and in place ≤30 days.	1. Activities (a) or (b) above are planned or scheduled, not an emergency response; or 2. Activities that are not eligible for SV and do not require an IP.

Notes:

1. For emergency response activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, Merrimack River from the Essex Dam to the mouth, and remaining tidal waters that are not rivers, the permittee must contact the USACE at (978) 318-8338 before or as soon as possible after the work authorized under GP 12(a) - (c) commences for the USACE to address effects under the Endangered Species Act.
2. An SVN submittal to USACE is not required for booms used for spill prevention, or properly contained and cleaned de minimus oil or hazardous substance discharges into navigable waters of the U.S.

GP 13. CLEANUP OF HAZARDOUS AND TOXIC WASTE (Authorities: §10 and §404)

Specific activities required to affect the containment, stabilization, or removal of hazardous or toxic waste materials, including court ordered remedial action plans or related settlements, which are performed, ordered or sponsored by a government agency with established legal or regulatory authority.

Not authorized under GP 13: (a) Establishment of new disposal sites; or (b) Expansion of existing sites used for the disposal of hazardous or toxic waste.

Self-Verification Eligible	Pre-Construction Notification Required
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in vegetated shallows and riffle and pool complexes.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, and (b) located in vegetated shallows and riffle and pool complexes. 2. Permanent and temporary impacts in tidal waters or navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, or loss of streambed occurs. 4. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Wetlands, vegetated shallows, mudflats, and riffle and pool complexes should be restored in place at the same elevation to the maximum extent practicable.
2. Activities undertaken entirely on a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site by authority of CERCLA, are not required to obtain permits under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act.

GP 14. SCIENTIFIC MEASUREMENT DEVICES (Authorities: §10 and §404)

Scientific measurement devices for measuring and recording scientific data, such as staff gauges, tide and current gauges, meteorological stations, water recording and biological observation devices, water quality testing and improvement devices, and similar structures. Also eligible are small weirs and flumes constructed primarily to record water elevation, flow and/or velocity. Upon completion of the use of the device to measure and record scientific data, the measuring device and any other structures or fills associated with that device (e.g., foundations, anchors, buoys, lines, etc.) must be removed to the maximum extent practicable and the site restored to preconstruction elevations.

Not authorized under GP 14 (IP required): (a) Permanent impacts that are >5,000 SF in tidal and non-tidal waters of the U.S.; >1000 SF in tidal saltmarsh, mud flats, riffle and pool complexes; or >100 SF in tidal vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible

1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows.

2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, (c) not located in saltmarsh and tidal vegetated shallows.

3. Temporary, non-biological sampling devices in waters that do not restrict or concentrate movement of aquatic organisms and will not adversely affect the course, condition, or capacity of a waterway for navigation.

4. Scientific measurement devices, and small weirs and flumes constructed primarily to record water quantity and velocity provided the discharge of fill is limited to 25 cubic yards. These cannot obstruct or restrict the waterway course, condition, capacity, and location.

5. Temporary measuring devices and associated structures (e.g., anchors, buoys, etc.) in tidal and non-tidal waters that do not require a PCN or IP.

Pre-Construction Notification Required

1. Biological sampling devices, weirs or flumes, or the activity restricts or concentrates movement of aquatic organisms.

2. Permanent towers located in navigable waters that record and measure scientific data.

3. Devices that are not eligible for SV and do not require an IP.

Note: An SVN submittal to USACE is not required for temporary measuring devices with a footprint of <10 SF, with a profile of <3 feet high measured from the substrate and located in water deeper than -10 feet MLW.

GP 15. SURVEY ACTIVITIES (Authorities: §10 and §404)

Survey activities such as soil borings, core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, sample plots or transects for wetland delineations, and historic resources surveys.

Not authorized under GP 15 (IP required): (a) Permanent impacts that are >1 acre in tidal and non-tidal waters; >1000 SF in tidal saltmarsh, mud flats, or riffle and pool complexes; or >100 SF in tidal vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, (c) not located in saltmarsh and tidal vegetated shallows.	1. Exploratory trenching (see Note 2) occurs in waterways (e.g., streams, tidal waters). 2. Activities associated with the recovery of historic resources, and the drilling and discharge of excavated material from test wells for oil and gas exploration. 3. Seismic exploratory operations occur in tidal waters, the Connecticut River from the Turners Falls Dam to the MA/CT border, or the Merrimack River from the Essex Dam to the mouth. This is to protect endangered species. 4. Activities that are not eligible for SV and do not require an IP.

Notes:

1. An SVN submittal is not required for wetland delineations, and core sampling conducted for preliminary evaluation of dredge project analysis.
2. For the purposes of GP 15, the term “exploratory trenching” means mechanical land or underwater clearing of the upper soil profile to expose bedrock or substrate for the purpose of mapping or sampling the exposed material.
3. The discharge of drilling mud and cuttings may require a permit under §402 of the CWA.

GP 16. LAND AND WATER-BASED RENEWABLE ENERGY GENERATION FACILITIES (Authorities: §10 and §404), AND HYDROPOWER PROJECTS (Authority: §10 and §404)

Structures and work in tidal waters and discharges of dredged or fill material into tidal and non-tidal waters for the construction, expansion, modification or removal of: (a) Land-based renewable energy production facilities (e.g., solar, wind, biomass, geothermal) and their attendant features; (b) Water-based wind or hydrokinetic renewable energy generation projects and their attendant features; and (c) Discharges of dredged or fill material associated with hydropower projects. Attendant features may include, but are not limited to, land-based collection and distribution facilities, control facilities, and parking lots. For each single and complete project in (b) above, no more than 10 generation units (e.g., wind turbines or hydrokinetic devices) are authorized in navigable waters of the U.S. Upon completion of the pilot project (see note 2), the generation units, transmission lines, and other structures or fills associated with the pilot project must be removed to the maximum extent practicable.

Not authorized under GP 16 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters, >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
In non-tidal waters, the combined permanent and temporary impacts for land-based activities are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. In non-tidal waters, the combined permanent and temporary impacts for land-based activities are (a) >5000 SF, or (b) located in vegetated shallows or riffle and pool complexes. 2. Permanent and temporary impacts in tidal waters. 3. Water-based wind or hydrokinetic renewable energy generation projects, and hydropower projects. 4. For all activities eligible for authorization under GP 16: a. The activity occurs in tidal waters or in, over or under navigable waters. b. Stream channelization, relocation, impoundment, or loss of streambed occurs. 5. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Utility lines constructed to transfer the energy from the land-based renewable generation or collection facility to a distribution system, regional grid, or other facility may be authorized by GP 6.
2. For the purposes of this GP, the term “pilot project” means an experimental project where the renewable energy generation units will be monitored to collect information on their performance and environmental effects at the project site.

GP 17. RESIDENTIAL, COMMERCIAL AND INSTITUTIONAL DEVELOPMENTS AND RECREATIONAL FACILITIES (AUTHORITIES: §404)

Discharges of dredged or fill material into non-tidal waters for the construction or expansion of: (a) Residences and residential subdivisions; (b) Residential, commercial and institutional building foundations and building pads; and (c) Recreational facilities such as playgrounds, playing fields, bikeways, trails, etc. This GP also authorizes attendant features that include, but are not limited to, roads, parking lots, garages, yards, and utility lines, and stormwater management facilities. This GP authorizes attendant features if they are necessary for the use of the project purpose.

Not authorized under GP 17 (IP required): (a) Permanent impacts that result in loss of non-tidal waters >1/2 acre; >1000 SF in riffle and pool complexes or vegetated shallows; or (b) Subsurface sewerage disposal systems in non-tidal waters.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) <5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. Stream channelization or relocation resulting in loss of streambed that is <200 LF.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≥5,000 SF, or (b) located in riffle and pool complexes or non-tidal vegetated shallows. 2. Stream and wetland crossings that require a PCN per GCs 20 TOY Restrictions and GC 31 Stream Work and Crossings & Wetland Crossings. 3. Stream channelization or relocation resulting in loss of streambed that is ≥200 LF. Stream impoundment activities of any kind. 4. Activities on USACE properties & USACE-controlled easements. 5. Activities that are not SV eligible and do not require an IP.

Notes:

1. Stream and wetland crossings (permanent and temporary), including those built with construction mats; and modifications (including sliplining), replacements or extensions to existing crossings.
2. See GC 22 for information on temporary construction mats.
3. Subdivisions: For residential subdivisions, the aggregate total loss of waters of United States authorized by this GP cannot exceed 1/2-acre. This includes any loss of waters of the United States associated with development of individual subdivision lots.

GP 18. AQUACULTURE (Authorities: §10 and §404)

(a) The installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures into navigable waters of the U.S.; (b) Discharges of dredged or fill material into tidal and non-tidal waters necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities; and (c) Shellfish seeding or brushing the flats projects. Any fill material imported to the project from offsite (this is limited to mineral growth medium used in culture trays) shall be clean and of comparable grain size to the native substrate. Activities authorized under this GP must have (a) their MA DMF Aquaculture Certificate letter for licensed shellfish aquaculture sites, (b) documentation that the applicant has coordinated with the U.S. Coast Guard regarding USCG Private Aids to Navigation standards, (c) their MEPA Certificate (if required), and (d) documentation that the applicant has contacted their local authorities (ex. harbormaster, select board, shellfish constable) for authorization of their facility.

Not authorized under GP 18 (IP required): (a) New, or expansions of, impoundments and semi-impoundments of tidal and non-tidal waters for the culture or holding of motile species such as lobster with an impounded area >½ acre; (b) Cultivation of a nonindigenous species (see Note 1) unless that species has been previously cultivated in the waterbody; (c) Cultivation of an aquatic nuisance species (see Note 1); (d) Attendant features such as docks, piers, boat ramps (see GP 4); (e) stockpiles, staging areas, or the deposition of shell material back into tidal and non-tidal waters as waste.

Self-Verification Eligible

1. In tidal waters, a new lease site area is (a) ≤2-acre, (b) not located in salt marsh, natural rocky habitat, or tidal vegetated shallows.

2. In tidal waters, *expansions* of existing lease sites not to exceed 2 acres for the entire site (e.g. 1 acre lease site increasing to a 2 acre lease site may qualify as SV). A PCN is required for expansions in salt marsh, natural rocky habitat, and tidal vegetated shallows.

3. Cages, racks that are elevated ≥2 feet above the ocean floor with legs within a lease site with ≤4 buoys marking the corners.

4. Floating cage strings with a single connecting line, ≤2 anchors and ≤2 end marker buoys per string within a lease site with ≤4 buoys marking the corners.

5. No activities located within 25 feet of tidal vegetated shallows.

6. Culture only indigenous species.

7. Not located in FNP or within a distance of three times the authorized depth of an FNP (see GC 15).

8. Not located in or impinge upon the value of any National Lands or Federal Properties.

9. Floating upweller docks that total ≤600 SF in area.

Pre-Construction Notification Required

1. Discharges of fill material associated with aquaculture >5,000 SF.

2. Research, educational, commercial-viability or experimental aquaculture gear activities >1,000 SF.

3. Kelp or finfish aquaculture.

4. Land-based hatchery intakes >3 inches in diameter.

5. Activities in water depths >10 feet mean low lower water (MLLW).

6. Activities with in-water lines, ropes or chains that are not SV eligible (see #3-4).

7. Activities occur in the Connecticut River from the Turners Falls Dam to the MA/CT border or the Merrimack River from the Essex Dam to the mouth. This is to protect endangered species.

8. New, or expansions of, impoundments and semi-impoundments for the culture or holding of motile species such as lobster with an impounded area ≤1/2 acre.

9. Activities that do not require an IP. Activities that do not require a PCN or an IP may be SV eligible.

Note: The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 defines: (a) nonindigenous species as “any species or other viable biological material that enters an ecosystem beyond its historic range, including any such organism transferred from one country into another”; and (b) aquatic nuisance species as “a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.”

GP 19. MINING ACTIVITIES (Authorities: §10 and §404)

Discharges of dredged or fill material into non-tidal waters for mining activities, except for coal mining and metallic mineral mining activities.

Not authorized under GP 19 (IP required): (a) Permanent impacts >1 acre in non-tidal waters; or (b) Activities in tidal waters.

Self-Verification Eligible	Pre-Construction Notification Required
In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes, non-tidal vegetated shallows, and streams.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, or (b) located in riffle and pool complexes, non-tidal vegetated shallows, and streams. 2. The activity occurs in non-tidal navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, loss of streambed, or discharge of tailings into streams occurs. 4. Work on USACE properties & USACE-controlled easements. 5. Activities that are not eligible for SV and do not require an IP.

GP 20. LIVING SHORELINES[1] (Authorities: §10 and §404)

Construction and maintenance of living shorelines to stabilize banks and shores in tidal waters. In non-tidal waters that are not subject to the ebb and flow of the tide, nature-based bank stabilization techniques such as bioengineering and vegetative stabilization may be authorized by GP 9. This GP authorizes those maintenance and repair activities in-kind that are necessary to address changing environmental conditions.

The following terms must be met for both SVs and PCNs as applicable: (a) Coir logs, coir mats, stone, native oyster shell, native wood debris, and other structural materials must be adequately anchored, of sufficient weight, or installed in a manner that prevents relocation in most wave action or water flow conditions, except for extremely severe storms; (b) For living shorelines consisting of tidal fringe wetlands, native plants appropriate for current site conditions, including salinity and elevation, must be used if the site is planted by the permittee; (c) Discharges of dredged or fill material into waters of the U.S., and oyster or mussel reef structures in navigable waters, must be the minimum necessary for the establishment and maintenance of the living shoreline; (d) If sills or other structural materials per PCN #4 must be constructed to protect fringe wetlands for the living shoreline, those structures must be the minimum size necessary to protect those fringe wetlands; (e) The activity must be designed, constructed, and maintained so that it has no more than minimal adverse effects on water and sediment movement between the waterbody and the shore and the movement of aquatic organisms between the waterbody and the shore; and (f) The living shoreline must be properly maintained and monitored, which may require periodic repair of sills, bioengineered components, or replacing sand fills after severe storms or erosion events. Vegetation may be replanted to maintain the living shoreline.

Not authorized under GP 20 (IP required): (a) The activity is ≥1000 feet in length along the bank (≥2000 LF both banks) unless waived by the District Engineer; or (b) The activity is >30 feet channel ward of mean low water in tidal waters; or (c) Upland reclamation activities; or (d) Stream channelization or relocation activities; or (e) Breakwaters, groins, jetties, or artificial reefs; or (f) Permanent impacts >1,000 SF in existing saltmarsh; >100 SF in existing tidal vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Tidal and non-tidal living shorelines ≤100 LF for each bank (≤200 LF for both banks). 2. Combined permanent and temporary impacts ≤5,000 SF in tidal waters, excluding existing salt marsh, tidal vegetated shallows, natural rocky habitat, and mudflats.	1. Tidal and non-tidal living shorelines >100 LF to <1000 LF (>200 LF to <2000 LF for both banks). 2. Permanent and temporary impacts in existing salt marsh, tidal vegetated shallows, or mudflats. 3. Work on USACE properties & USACE-controlled easements. 4. Use of stone sills, native oyster shell, native wood debris, or other structural materials.

Notes:

1. PCNs require monitoring for a minimum of 5 years in accordance with an approved restoration plan, unless otherwise determined by the USACE. The first year of monitoring will be the first year that the site has been through a full growing period after completion of construction and planting.
2. Applicants are encouraged to obtain a MEPA certificate prior to submitting a USACE permit application.

[1] A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural "soft" elements alone or in combination with some type of harder shoreline structure (e.g., oyster or mussel reefs or rock sills) for added protection and stability. Living shorelines should maintain the natural continuity of the land-water interface and retain or enhance shoreline ecological processes. Living shorelines must have a substantial biological component, either tidal or lacustrine fringe wetlands or oyster or mussel reef structures.

GP 21. AGRICULTURAL ACTIVITIES (Authority: §404)

Discharges of dredged or fill material in non-tidal waters for agricultural activities, including the construction of building pads for farm buildings. Authorized activities include: (a) installation, placement, or construction of drainage tiles, ditches, or levees; mechanized land clearing; land leveling; the relocation of existing serviceable drainage ditches; and similar activities; (b) construction of farm ponds, excluding perennial streams, provided the farm pond is used solely for agricultural purposes; and (c) discharges of dredged or fill material to relocate existing serviceable drainage ditches constructed in non-tidal streams.

Not authorized under GP 21 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters; or >1000 SF in riffle and pool complexes, or non-tidal vegetated shallows; (b) Work in tidal waters; or (c) Construction of farm ponds in perennial streams.

Self-Verification Eligible	**Pre-Construction Notification Required**
In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, or (b) located in riffle and pool complexes and non-tidal vegetated shallows. 2. Activities occur in non-tidal navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, loss of streambed, or farm ponds in non-perennial streams occurs. 4. Activities that are not eligible for SV and do not require an IP.

Note: Some discharges for agricultural activities may qualify for an exemption under Section 404(f) of the CWA (see 33 CFR 323.4). This GP authorizes the construction of farm ponds that do not qualify for the CWA §404(f)(1)(C) exemption because of the recapture provision at §404(f)(2).

GP 22. RESHAPING EXISTING DRAINAGE DITCHES, CONSTRUCTION OF NEW DITCHES, AND MOSQUITO MANAGEMENT (Authorities: §10 and §404)

Discharges to modify the cross-sectional configuration of currently serviceable drainage ditches constructed in tidal and non-tidal waters, for the purpose of improving water quality by regrading the drainage ditch with gentler slopes, which can reduce erosion, increase growth of vegetation, and increase uptake of nutrients and other substances by vegetation. Also authorized are mosquito reduction activities.

Not authorized under GP 22 (IP required): Stream channelization, relocation, impoundments, or loss of streambed.

Self-Verification Eligible	**Pre-Construction Notification Required**
≤500 linear feet of drainage ditch will be reshaped provided excavated material is deposited in an upland area.	1. >500 linear feet of drainage ditch will be reshaped, excavated material is deposited in a water of the U.S., or the reshaping of the ditch increases the drainage capacity beyond the original as-built capacity or expands the area drained by the ditch as originally constructed (i.e., the capacity of the ditch is not the same as originally constructed or drains additional wetlands or other waters of the U.S.). 2. Permanent and temporary impacts in tidal vegetated shallows. 3. New ditches or relocation of drainage ditches constructed in waters of the U.S. (i.e., the location of the centerline of the reshaped drainage ditch is not approximately the same as the location of the centerline of the original drainage ditch). 4. Activities that are not eligible for SV and do not require an IP.

Note: Some ditch activities are exempt under Section 404(f) of the CWA (see 33 CFR 323.4).

GP 23. LINEAR TRANSPORTATION PROJECTS AND WETLAND/STREAM CROSSINGS (Authorities: §10 & §404)

Activities[1] required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., driveways, roads, highways, railways, trails, airport runways, and taxiways) and attendant features. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats (see Note 1), necessary to construct the linear transportation project.

Not authorized under GP 23 (IP required): (a) Permanent impacts for any single and complete project that are >1 acre in non-tidal waters; >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars (see GP 17); or (d) New tide gates.

Self-Verification Eligible

1. In non-tidal waters, the combined permanent and temporary impacts are a) ≤5,000 SF; b) not located in riffle and pool complexes and non-tidal vegetated shallows; and c) meet the Massachusetts River and Stream Crossing Standards

2. Existing crossings (e.g., culverts, elliptical or arch pipes, etc.) are not modified by (a) decreasing the diameter of the crossing or (b) changing the friction coefficient, such as through slip lining (retrofitting an existing culvert by inserting a smaller diameter pipe), culvert relining or invert lining.

3. Stream channelization or relocation resulting in loss of streambed that is <200 LF.

Pre-Construction Notification Required

1. In non-tidal waters, the combined permanent and temporary impacts are a) >5,000 SF; b) located in vegetated shallows or riffle and pool complexes; or c) do not meet the Massachusetts River and Stream Crossing Standards (see note 4).

2. The activity occurs in tidal waters, salt marsh, or in, over or under navigable waters of the U.S.

3. Stream and wetland crossings that require a PCN per GC 20 TOY Restrictions and GC 31 Stream Work and Crossings & Wetland Crossings.

4. Stream channelization or relocation resulting in loss of streambed that is ≥200 LF. Stream impoundment activities of any kind.

5. Work on USACE properties & USACE-controlled easements.

6. Activities that are not eligible for SV and do not require an IP.

Notes:

1. See GC 22 for information on temporary construction mats.
2. Discharges of dredged or fill material incidental to the construction of bridges across navigable waters of the U.S. may be authorized under GP 8.
3. Loss of streambed does not require a PCN when bridge piers or similar supports are used.
4. In their PCN application submission to the USACE, applicants must explain why they are unable to meet the Massachusetts River and Stream Crossing Standards.
5. For tidal crossings, modeling is encouraged as a method to verify the proposed crossing would not be undersized and resilient to the effects of sea level rise.

[1] Stream crossings must conform with the MA Stream Crossing Guidelines when practicable and comply with all applicable GCs of this document (Section IV).

GP 24. TEMPORARY CONSTRUCTION, ACCESS, AND DEWATERING (Authorities: §10 and §404)

Temporary structures, work, and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites that are not authorized under another GP activity.

Not authorized under GP 24 (IP required): (a) Permanent structures or impacts; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Use of cofferdams to dewater wetlands or other aquatic areas to change their use; (d) Temporary stream crossings (see GPs 6, 17, 23); (e) Structures or fill left in place after construction is completed.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, temporary impacts are a) ≤5,000 SF; b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, temporary impacts are a) ≤5,000 SF, b) ≤1,000 SF in mudflats and/or natural rocky habitat, and c) not located in saltmarsh and tidal vegetated shallows. 3. Structures in navigable waters of the U.S. provided impacts do not require a PCN and they are left in place ≤30 days.	1. In non-tidal waters, temporary impacts are a) >5,000 SF; b) located in riffle and pool complexes or non-tidal vegetated shallows. 2. In tidal waters, temporary impacts are a) >5,000 SF; b) >1,000 SF in mudflats and/or natural rocky habitat, or (c) located in saltmarsh and tidal vegetated shallows. 3. Activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, or Merrimack River from the Essex Dam to the mouth, involving temporary impacts unless they are performed <5 feet waterward from OHW or HTL and in the dry. This is to protect endangered species; or 4. Activities not eligible for SV and do not require an IP.

Notes:

1. Turbidity or sediment resuspension is generally not considered to occur when properly using management techniques to work in dry conditions. See GC 25.
2. Total impact areas under SV Eligible 1-2 exclude use of temporary construction mats. See GC 22 for information on temporary construction mats.
3. An SVN submittal to USACE is not required for SV #3 above.

GP 25. EMERGENCY SITUATIONS (Authorities: §10 and §404)

Structures or work in or affecting navigable waters of the U.S. and the discharge of dredged or fill material into waters of the U.S., including wetlands, necessary for repair or protection measures associated with an emergency situation[1], MassDEP Emergency Declaration/Certification, or FEMA Declared Disaster. The activity shall be the minimum necessary to alleviate the immediate emergency unless that additional work would result in no more than minimal effects to aquatic environment and is necessary to reduce the potential for future failure or loss of the structure or site. Typical activities authorized under this GP include, but are not limited to, restoration of damaged areas; bank stabilization; temporary fills for staging, access, and dewatering; and, repair, replacement, or rehabilitation of existing structures and/or fills (i.e., roads, bridges, utility pipelines and flood control structures, including attendant features, and other existing structures located in waters of the U.S.).

For the restoration of areas damaged by storms floods, or other discrete events: (a) The restored area must not extend waterward of the ordinary high-water mark or high tide line that existed prior to the damage. (b) The slope of the restored area below the ordinary high-water mark or high tide line must not exceed the slope that existed prior to the damage. (c) The bottom elevation of the restored area must not exceed the bottom elevation that existed prior to the damage (i.e., the restored area must not result in a reduction in the depth of the waterbody that existed prior to the damage). (d) Except in cases of FEMA reimbursement, the activity must be initiated, under contract to commence, or funds shall be allocated for the activity within 30 days of authorization under GP 25.

Not authorized under GP 25 (IP required): (a) Permanent impacts for a single and complete project >1/2 acre in tidal waters, unless the district engineer waives this criterion by making a written determination concluding that the activity will result in no more than minimal adverse environmental effects; >1,000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >5,000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1,000 SF in vegetated shallows; (c) New structures or fills that did not previously exist before the storm event or other discrete event (see other GPs).

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Activities that qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) and/or receive an Emergency Certification pursuant to 310 CMR 10.06 and/or meet the requirements of 314 CMR 9.12(2) or (3); and 2. Activities eligible under a FEMA Declared Disaster that also comply with #1 above.	1. Activities that are eligible under a FEMA Declared Disaster and do not qualify under SV #1. 2. Minor deviations in the structure or fill area, including those to existing structures or fills are authorized due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to alleviate the emergency. 3. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Review the GCs (Section IV) to confirm if a PCN is not required elsewhere in this document.
2. If the activity is not a MassDEP Emergency Declaration/Certification, does not meet the requirements of 314 CMR 9.12(2) or (3), or is not a FEMA Declared Disaster, applicants must explain in writing why their activity qualifies as an emergency (see footnote) to be eligible under GP 25.
3. SV eligible activities qualify under the general 401 WQC MassDEP issued for the 2023 MA GPs (GC 9).

[1] An emergency, as determined by this office and 33 CFR 325.2(e)(4), is one which would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship if corrective action requiring a Department of the Army permit is not undertaken within a time period less than the normal time to process the request under standard processing procedures.

SECTION IV. GENERAL CONDITIONS:

To qualify for GP authorization, the applicant must comply with the following general conditions, as applicable, in addition to authorization-specific conditions imposed by the division or district engineer.

1. Other Permits
2. Federal Jurisdictional Boundaries
3. Single and Complete Projects
4. Use of Multiple General Permits
5. Suitable Material
6. Tribal Rights & Burial Sites
7. Avoidance, Minimization, and Compensatory Mitigation
8. Water Quality & Stormwater Management
9. Coastal Zone Management
10. Federal Threatened and Endangered Species
11. Essential Fish Habitat
12. National Lands
13. Wild and Scenic Rivers
14. Historic Properties
15. USACE Property and Federal Projects (§408)
16. Navigation
17. Permit/Authorization Letter On-Site
18. Storage of Seasonal Structures
19. Pile Driving and Pile Removal in Navigable Waters
20. Time of Year Restrictions
21. Heavy Equipment in Wetlands
22. Temporary Fill & Construction Mats
23. Restoration of Wetland Areas
24. Bank Stabilization
25. Soil Erosion and Sediment Controls
26. Aquatic Life Movements and Management of Water Flows
27. Spawning, Breeding, and Migratory Areas
28. Vernal Pools
29. Invasive Species
30. Fills Within 100-Year Floodplains
31. Stream Work and Crossings & Wetland Crossings
32. Utility Line Installation and Removal
33. Water Supply Intakes
34. Coral Reefs
35. Blasting
36. Inspections
37. Maintenance
38. Property Rights
39. Transfer of GP Verifications
40. Modification, Suspension, and Revocation
41. Special Conditions
42. False or Incomplete Information
43. Abandonment
44. Enforcement Cases
45. Previously Authorized Activities
46. Duration of Authorization

1. Other Permits. Authorization under these GPs does not obviate the need for the permittee to obtain other Federal, State, or local permits, approvals, or authorizations required by law. Permittees are responsible for obtaining all required permits, approvals, or authorizations. Activities that are not regulated by the State, but subject to USACE jurisdiction, may still be eligible for these GPs.

2. Federal Jurisdictional Boundaries.
a. Applicability of these GPs shall be evaluated with reference to Federal jurisdictional boundaries. Activities shall be evaluated with reference to "waters of the U.S." under the CWA (33 CFR 328) and "navigable waters of the U.S." under §10 of the Rivers and Harbors Act of 1899 (33 CFR 329). Permittees are responsible for ensuring that the boundaries used satisfy the Federal criteria defined at 33 CFR 328-329. These sections prescribe the policy, practice, and procedures to be used in determining the extent of the USACE jurisdiction. Note: Waters of the U.S. includes all waters pursuant to 33 CFR 328.3(a), and adjacent wetlands as the term is defined in 33 CFR 328.3(c).
b. Wetlands shall be delineated in accordance with the USACE Wetlands Delineation Manual and the most recent Northcentral/Northeast Regional Supplement. Wetland delineation and jurisdiction information is located at: www.nae.usace.army.mil/missions/regulatory/jurisdiction-and-wetlands and maps are located at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
c. Vegetated shallows shall be delineated when present on the project site. Vegetated shallow survey guidance and maps are located at: www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
d. Natural rocky habitats shall be delineated when present on the project site. The definition of natural rocky habitats is in Section VII of the MA GP. Natural rocky habitat survey guidance and maps are located at: www.nae.usace.army.mil/ missions/regulatory/state-general-permits/massachusetts-general-permit.

3. Single and Complete Projects. The MA GP shall not be used for piecemeal work and shall be applied to single and complete projects. The term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers.
a. For non-linear projects, a single and complete project must have independent utility. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed, even if the other phases were not built, can be considered as separate single and complete projects with independent utility.
b. Unless USACE determines the activity has independent utility, all components of a single project and/or all planned phases of a multi-phased project (e.g., subdivisions should include all work such as roads, utilities, and lot development) shall be evaluated as one single and complete project.
c. For linear projects such as power lines or pipelines with multiple crossings, a "single and complete project" is all crossings of a single water of the U.S. (i.e., single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately. If any crossing requires a PCN review or an individual permit review, then the entire linear project shall be reviewed as one project under PCN or the individual permit procedures.

4. Use of Multiple General Permits. The use of more than one GP for a single and complete project is prohibited, except when the acreage loss of waters of the U.S. authorized by the GPs does not exceed the acreage limit of the GPs with the highest specified acreage limit. For example, if a road crossing over waters is constructed under GP 23, with an associated utility line

crossing authorized by GP 6, if the maximum acreage loss of waters of the U.S. for the total project is ≥1 acre it shall be evaluated as an IP.

5. Suitable Material & Discharge of Pollutants. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). All activities involving any discharge into waters of the U.S. authorized under these GPs shall be consistent with applicable water quality standards, effluent limitations, standards of performance, prohibitions, and pretreatment standards and management practices established pursuant to the CWA (33 U.S.C. 1251), and applicable state and local laws. If applicable water quality standards, limitations, etc., are revised or modified during the term of this GP, the authorized work shall be modified to conform with these standards within six months from the effective date of such revision or modification, or within a longer period of time deemed reasonable by the District Engineer in consultation with the Regional Administrator of the EPA. Unless monitoring data indicates otherwise, applicants may presume that their activity complies with state water quality standards provided they are in compliance with the Section 401 WQC (Applicable only to the Section 404 activity).

6. Tribal Rights & Burial Sites

a. For all SV and PCN applications, prospective permittees shall follow the guidance set forth in Appendix A, Guidance for NHPA Section 106 Compliance in Massachusetts.

b. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

c. Many tribal resources are not listed on the National Register of Historic Places (NRHP) and may require identification and evaluation in collaboration with the identifying tribe and by qualified professionals. The Tribal Historic Preservation Officer (THPO) and State Historic Preservation Officer (SHPO) may be able to assist with locating information on:

i. Previously identified tribal resources; and
ii. Areas with potential for the presence of tribal resources.

d. Discovery of Previously Unknown Remains and Artifacts: If any previously unidentified human remains, cultural deposits, or artifacts are discovered while accomplishing the activity authorized by this permit, you must immediately notify the USACE of what you have found, and to the maximum extent practicable, cease work and avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The USACE will initiate the appropriate the Federal, Tribal, and state coordination required to determine if the items or remains are eligible for listing in the NRHP and warrant a recovery effort or can be avoided.

e. Burial Sites: Burial sites, marked or unmarked, are subject to state law (Massachusetts Unmarked Burial Law). Native American burial sites on federal or tribal land are subject to the provisions of Native American Graves Protection and Repatriation Act (NAGPRA). Regulated activities may not result in disturbance or removal of human remains until disposition of the remains has been determined by the appropriate authority under these laws, and the work is authorized by the USACE. Regulated activities which result in an inadvertent discovery of human remains must stop immediately, and the USACE, as well as the appropriate state and tribal authority, must be notified. Regulated work at inadvertent discovery sites requires compliance with state law or NAGPRA, as appropriate, prior to re-starting work.

7. Avoidance, Minimization, and Compensatory Mitigation. To qualify under the MA GP, activities must comply with Section V Mitigation Standards and the following as applicable:

a. Avoid and Minimize: Activities must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the U.S. to the maximum extent practicable at the project site. Avoidance and minimization are required to the extent necessary to ensure that the adverse effects to the aquatic environment (both area and function) are no more than minimal.

b. Compensatory mitigation for unavoidable impacts to waters of the U.S., including direct, indirect, secondary, and temporal loss, will generally be required for permanent impacts that exceed the thresholds identified in Section V, and may be required for temporary impacts, to offset unavoidable impacts which remain after all appropriate and practicable avoidance and minimization has been achieved and to ensure that the adverse effects to the aquatic environment are no more than minimal. Proactive restoration projects or temporary impact work with no secondary effects may generally be excluded from this requirement.
c. Mitigation proposals shall follow the guidelines found in the Compensatory Mitigation for Losses of Aquatic Resources; Final Rule April 10, 2008; 33 CFR 332. Prospective permittees may purchase mitigation credits in-lieu of permittee-responsible mitigation as compensation for unavoidable impacts to waters of the U.S. in the Commonwealth of Massachusetts.

8. Water Quality & Stormwater Management. The 401 WQC requirement applies to all activities listed under GPs 1-25, unless determined otherwise by MassDEP. Permittees shall also satisfy stormwater management requirements in Massachusetts.

a. General 401 WQC: MassDEP issued a WQC on April 21, 2023 which conditionally certifies all activities in GPs 1 – 24 eligible for SV and PCN so long as the activity is described in 314 CMR 9.03, and is not an activity described in 314 CMR 9.04, and so long as the activity meets all other requirements, terms and conditions of the WQC. The MassDEP WQC also conditionally certifies activities described in GP 25 so long as the activity meets all other conditions of the WQC. Emergency projects described in GP 25 must obtain an emergency certification or otherwise be authorized pursuant to 310 CMR 10.06, qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) issued by the MassDEP, or meet the requirements of 9.12(2) or (3) in order to be certified under the WQC. Prospective permittees may refer to the following link to determine if their activity is eligible: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/ Massachusetts-General-Permit/. The General 401 WQC is located here, and it provides detailed information regarding what activities are certified and the conditions for certification. Activities listed in 314 CMR 9.03 that are not exempt from the Wetland Protection Act must have a valid Final Order of Conditions (OOC) or Final Restoration Order of Conditions pursuant to 310 CMR 10.00 to be eligible under the General 401 WQC.
b. Individual 401 WQC: Prospective permittees shall contact MassDEP and apply for an individual 401 WQC if their activity does not qualify for a General 401 WQC as outlined above. MassDEP may issue, waive, or deny the individual 401 WQC on a case-by-case basis. All activities listed in 314 CMR 9.04 must obtain an individual 401 WQC from MassDEP to be eligible under these GPs. When an Individual 401 WQC is required for *PCN activities*, the prospective permittee shall submit their Individual 401 WQC application concurrently to MassDEP and USACE to comply with 40 CFR 121.
c. The prospective permittee is responsible for determining the appropriate 401 WQC requirement and submitting this information to the USACE at the time of their PCN application or when completing their SVN. Prospective permittees that are unsure of whether their activity has been certified should contact MassDEP for a determination.
d. As applicable, all activities shall be compliant with the Massachusetts Stormwater Handbook. The Stormwater Handbook can be accessed on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.
e. No work requiring authorization under Section 404 of the CWA may be performed unless (1) the prospective permittee qualifies for coverage under the April 21, 2023 General 401 WQC, (2) the prospective permittee receives an individual Section 401 WQC from the MassDEP, or (3) the MassDEP waives individual Section 401 WQC.

9. Coastal Zone Management. The permittee must obtain CZM consistency concurrence when an activity is located in the coastal zone in order to be eligible under the MA GP. This requirement

shall be satisfied by acquiring one of the following from the Massachusetts Office of Coastal Zone Management (MA CZM):

a. General CZM Federal Consistency Concurrence (General Concurrence): MA CZM has granted General Concurrence for all SV and PCN activities for GPs 1-25. The prospective permittee must obtain all applicable permits and approvals before construction of the authorized activity begins (e.g., before work begins on site). For SVs, General Concurrence is automatically granted and no further action is required from the prospective permittee. For PCNs, the USACE will coordinate with MA CZM to acquire General Concurrence as part of the PCN application review.
b. Individual CZM Federal Consistency Concurrence (Individual Concurrence): In certain cases, MA CZM may elevate any GP activity 1-25 and require Individual Concurrence. The prospective permittee must contact MA CZM and follow the procedures to obtain Individual Concurrence as determined appropriate by MA CZM.
c. Permittees must obtain CZM consistency concurrence as outlined above before commencing work authorized under these GPs.

10. Federal Threatened and Endangered Species

a. No activity is authorized under any GP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any GP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of "effects of the action" for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA section 7 regarding "activities that are reasonably certain to occur" and "consequences caused by the proposed action."
b. Other Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If a PCN is required for the proposed activity, the Federal permittee must provide USACE with the appropriate documentation to demonstrate compliance with those requirements. The USACE will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.
c. USFWS ESA-Listed Species: Non-federal applicants shall use the USFWS website, Information for Planning and Consultation (IPAC), to determine if their activity is located within the ESA-listed species range. The IPAC website can be accessed on the NAE Regulatory website: https://www. nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. Applicants shall ensure they have an updated, valid species list before construction begins. This may require applicants to update their species list in IPAC before the start of construction. Note: Applicants should refer to the NAE Regulatory Website at the link above to determine if they have been designated as a non-federal representative. Applicants shall complete Section 7 consultation according to the guidance document located on the NAE Regulatory Website. After completing the Rangewide Determination Key and reaching the outcome "may affect, not likely to adversely affect", you may be required to wait up to 15 days before that outcome is final and compliance under Section 7 of the ESA is fulfilled.

i. *Self-Verification Criteria*: The activity is SV-eligible if:
   1) The activity is not located within the ESA-listed species range;
   2) Another (lead) Federal agency has completed Section 7 consultation; or
   3) The activity is located within the ESA-listed species range ***and*** USACE has designated the applicant as a non-federal representative under 50 CFR 402.08 of the ESA for all

species within the project's action area. As the non-federal representative, the applicant shall complete consultation through IPAC and reach the outcome of "no effect" or "not likely to adversely affect".

ii. *Pre-Construction Notification Criteria*: The activity requires a PCN if:

1) The activity is located within the ESA-listed species range ***and*** USACE has NOT designated the applicant as a non-federal representative under 50 CFR 402.08 of the ESA for all species within the project's action area;

2) The activity is located in designated or proposed critical habitat; or

3) The activity is located within the ESA-listed species range and completion of the IPAC determination key has resulted in the outcome of "may affect" or "may affect, likely to adversely affect"; or

4) A PCN is required elsewhere in this document.

d. NOAA-Listed Species: Non-federal applicants shall refer to the Section 7 Mapper for federally listed species to determine if any species are mapped as present. When NOAA-listed species are present, the applicant shall generate a species report through the mapper and submit this document as part of their PCN or SVN submission. The NOAA Fisheries' Section 7 Mapper can be accessed here on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

e. Authorization of an activity by an GP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

11. Essential Fish Habitat (EFH).

a. SV eligible activities have been determined to result in no more than minimal adverse effects, provided the permittee complies with all terms and conditions of the MA GP as appliable to the activity. NMFS has granted General Concurrence [50 CFR 600.920(g)] for all SV eligible activities. These activities do not require project specific EFH consultation.

b. For PCN required activities, the applicant is required to describe and identify potential adverse effects to EFH and should refer to NOAA Fisheries' EFH Mapper (http://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper) and Omnibus Essential Fish Habitat Amendment 2 Volume 2: EFH and HAPC Designation Alternatives and Environmental Impacts (https://www.habitat.noaa.gov/application/efhmapper/oa2_efh_hapc.pdf). If an activity is located within EFH, the PCN application must contain:

1. A description of the action located in EFH.
2. An analysis of the potential adverse effects of the action on EFH and the managed Species.
3. Conclusions regarding the effects of the action on EFH.
4. Proposed mitigation, if applicable (refer to the mitigation thresholds located in Section V).

c. Federal agencies shall follow their own procedures for complying with the EFH requirements of the Magnuson-Stevens Fishery Conservation and Management Act. For activities requiring a PCN, the applicant is responsible for furnishing documentation that demonstrates consultation for EFH has been completed.

d. For PCN activities, no work may commence until EFH consultation as required by the Magnuson-Stevens Act has been completed.

12. National Lands. Activities that impinge upon the value of any National Wildlife Refuge, National Forest, National Marine Sanctuary, National Historic Landmarks or any other area administered by the National Park Service, U. S. Fish and Wildlife Service (USFWS) or U.S. Forest Service (USFS) require a PCN or Individual Permit. Federal land managers seeking authorization for activities located in the above listed National Lands may proceed under SV, unless a PCN is required elsewhere in this document.

13. Wild and Scenic Rivers. The following activities in designated river or study river segments in the National Wild and Scenic River (WSR) System require a PCN unless the Federal agency with direct management responsibility for such river, in Massachusetts this is generally the National Park Service, has determined in writing to the proponent that the proposed work will not adversely affect the WSR designation or study status:

a. Activities that occur in WSR segments, in and 0.25 miles up or downstream of WSR segments, or in tributaries within 0.25 miles of WSR segments;
b. Activities that occur in wetlands within 0.25 miles of WSR segments;
c. Activities that have the potential to alter free-flowing characteristics in WSR segments.

No GP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

As of May 10, 2023, affected rivers in Massachusetts include: the Taunton River (40 miles), Sudbury River (16.6 miles), Assabet River (4.4 miles), Concord River (8 miles), Nashua River (27 miles), Squannacook River (16.3 miles), Nissitissit River (4.7 miles), and the Westfield River, including West Branch, Middle Branch, Gendale Brook, East Branch, Drowned Land Brook, Center Brook, Windsor Jambs Brook, Shaker Mill Brook, Depot Brook, Savery Brook, Watson Brook, Center Pond Brook (78.1 miles). The most up to date list of designated and study rivers and their descriptions may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

14. Historic Properties

a. For all SV and PCN applications, permittees shall follow the guidance set forth in Appendix A, Guidance for NHPA Section 106 Compliance in Massachusetts.

b. No undertaking authorized by these GPs shall cause effects[1] (defined in 36 CFR Part 800 and 33 CFR Part 325, Appendix C, and its Interim Guidance) on properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places (NRHP)[2], including previously unknown historic properties within the permit area, unless the USACE or another Federal action agency has satisfied the consultation requirements of Section 106 of the National Historic Preservation Act (Section 106). If another Federal agency is determined the lead federal agency for compliance with Section 106, applicant must obtain the appropriate documentation and provide this information to the USACE to demonstrate compliance with Section 106. The applicant shall not begin the activity until the USACE notifies them in writing that the documentation provided satisfies Section 106 requirements.

[1] Effect means the alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register of Historic Properties.
[2] See the NAE Regulatory website, National Register of Historic Places link here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

c. Many historic properties are not listed on the NRHP and may require identification and evaluation by qualified historic preservation and/or archaeological consultants. The State Historic Preservation Officer (SHPO), Massachusetts Board of Underwater Archaeological Resources (BUAR), local historical societies, certified local governments, general public, and NRHP may also be able to assist with locating information on:

i. Previously identified historic properties; and
ii. Areas with potential for the presence of historic properties.

d. Discovery of Previously Unknown Remains and Artifacts: If any previously unidentified human remains, cultural deposits, or artifacts are discovered while accomplishing the activity authorized by this permit, you must immediately notify the USACE of what you have found, and to the maximum extent practicable, cease work and avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The USACE will initiate the Federal, State and tribal coordination required to determine if the items or remains warrant a recovery effort and/or if the site is eligible for listing in the National Register of Historic Places.

e. Section 110k: Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. § 306113) prevents the USACE from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106, has intentionally significantly adversely effected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the USACE, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the USACE is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties effected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or effects historic properties on tribal lands or effects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

f. Underwater Archaeological Resources: Under Massachusetts General Law Ch. 6, s.'s 179-180, and Ch. 91, s. 63, the BUAR has statutory jurisdiction within state waters and is the sole trustee of the Commonwealth's underwater heritage, charged with the responsibility of encouraging the discovery and reporting, as well as the preservation and protection, of underwater archaeological resources. Underwater archaeological resources located within the waters of the Commonwealth of Massachusetts are property of the Commonwealth, which holds title to these resources and retains regulatory authority over their use. Under Massachusetts General Law, no person, organization or corporation may "remove, displace, damage, or destroy" any underwater archaeological resources located within the Commonwealth's submerged lands except through consultation with the BUAR and in conformity with the permits it issues. https://www.mass.gov/orgs/board-of-underwater-archaeological-resources.

15. USACE Property and Federal Projects. (33 USC §408)

a. USACE projects and property can be found at: https://www.nae.usace.army.mil/Missions/Civil-Works/.

b. In addition to any authorization under these GPs, prospective permittee shall contact the USACE Real Estate Division (https://www.nae.usace.army.mil/Missions/Real-Estate-Division/) at (978) 318-8585 for work occurring on or potentially affecting USACE properties and/or USACE-controlled easements. Work may not commence on USACE properties and/or USACE-controlled easements until they have received any required USACE real estate documents evidencing site-specific permission to work.

c. Any proposed temporary or permanent occupation or alteration of a Federal project (including, but not limited to, a levee, dike, floodwall, channel, anchorage, breakwater, seawall, bulkhead, jetty, wharf, pier, or other work built or maintained but not necessarily owned by the United States),

is not eligible for SV and requires a PCN. This includes all proposed structures and work in, over, or under a USACE federal navigation project (FNP) or in the FNP's buffer zone. The buffer zone is an area that extends from the horizontal limits of the FNP to a distance of three times the FNP's authorized depth. The activity also requires review and approval by the USACE pursuant to 33 USC 408 (Section 408 Permission). The prospective permittee may reach out to the POCs located here: https://www.nae.usace.army.mil/ Missions/Section-408/.
d. Any structure or work constructed in a FNP or its buffer zone shall be subject to removal at the owner's expense prior to any future USACE dredging or the performance of periodic hydrographic surveys.
e. Where a Section 408 permission is required, written verification for the PCN will not be issued prior to the decision on the Section 408 permission request.

16. Navigation
a. No activity may cause more than a minimal adverse effect on navigation.
b. Any safety lights and signals prescribed by the U.S. Coast Guard, must be installed, and maintained at the permittee's expense on authorized facilities in navigable waters of the U.S.
c. There shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein, and no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized herein.
d. The permittee understands and agrees that if future U.S. operations require the removal, relocation, or other alteration of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from USACE, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the U.S. No claim shall be made against the U.S. on account of any such removal or alteration.

17. Permit/Authorization Letter On-Site. For PCNs, the permittee shall ensure that a copy of these GPs and the accompanying authorization letter are at the work site (and the project office) whenever work is being performed, and that all personnel with operational control of the site ensure that all appropriate personnel performing work are fully aware of its terms and conditions. The entire permit authorization shall be made a part of any and all contracts and sub-contracts for work that affects areas of USACE jurisdiction at the site of the work authorized by these GPs. This shall be achieved by including the entire permit authorization in the specifications for work. The term "entire permit authorization" means these GPs, including GCs and the authorization letter (including its drawings, plans, appendices, special conditions, and other attachments), and any permit modifications. If the authorization letter is issued after the construction specifications, but before receipt of bids or quotes, the entire permit authorization shall be included as an addendum to the specifications. If the authorization letter is issued after receipt of bids or quotes, the entire permit authorization shall be included in the contract or sub-contract as a change order. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions contained within the entire authorization letter, and no contract or sub-contract shall require or allow unauthorized work in areas of USACE jurisdiction. For SVs, the permittee shall ensure that a complete and signed copy of the SVN is present on site during construction and is made available for review at any time by USACE and other Federal, State, & Local regulatory agencies. A complete and signed copy of the SVN must be submitted to USACE Regulatory within 30 days of initiating construction of the authorized activity, unless stated otherwise in the applicable GP.

18. Storage of Seasonal Structures. Coastal structures such as pier sections, floats, etc., that

are removed from the waterway for a portion of the year (often referred to as seasonal structures) shall be stored in an upland location, located above MHW and not in tidal wetlands. These seasonal structures may be stored on the fixed, pile-supported portion of the structure that is seaward of MHW. This is intended to prevent structures from being stored on the marsh substrate and the substrate seaward of MHW.

19. Pile Driving and Pile Removal in Navigable Waters.
a. Derelict, degraded or abandoned piles and sheet piles in navigable waters of the U.S., except for those inside existing work footprints for piers, must be completely removed, cut and/or driven to 3 feet below the substrate to prevent interference with navigation, and existing creosote piles that are affected by project activities shall be completely removed if practicable. In areas of fine-grained substrates, piles must be removed by the direct, vibratory or clamshell pull method[1] to minimize sedimentation and turbidity impacts and prevent interference with navigation from cut piles. Removed piles shall be disposed of in an upland location landward of MHW or OHW and not in wetlands, tidal wetlands or mudflats.
b. A PCN is required for the installation or removal of structures with jetting techniques.
c. A PCN is required for the installation of >12 inch-diameter piles of any material type or steel piles of any size in tidal waters, unless they are installed in the dry. If piles are not installed in the dry:
i. Impact pile driving shall commence with an initial set of three strikes by the hammer at 40% energy, followed by a one-minute wait period, then two subsequent 3-strike sets at 40% energy, with one minute waiting periods, before initiating continuous impact driving.
ii. Vibratory pile driving shall be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period shall be repeated two more times, followed immediately by pile-driving at full rate and energy.
iii. In addition to using a soft start at the beginning of the workday for pile driving as described in 19c(i-ii), a soft start must also be used at any time following a cessation of pile driving for a period of 30 minutes or longer.
d. Bubble curtains may be used to reduce sound pressure levels during vibratory or impact hammer pile driving.

20. Time-of-Year (TOY) Restrictions. Activities that include in-water work must comply with the TOY Restrictions below to be SV eligible, otherwise a PCN is required. PCN submittals shall contain written justification for deviation from the TOY Restrictions. The term “in-water work” does not include conditions where the work site is “in-the-dry” (e.g., intertidal areas exposed at low tide). The term “in-the-dry” includes work contained within a cofferdam so long as the cofferdam is installed and subsequently removed outside the TOY Restriction. The TOY restrictions stated in Appendix B of the MA DMF Technical Report TR-47[2] can apply instead for activities in tidal waters if (1) TOYs are provided for a specific waterbody where the activity is proposed and (2) the TOYs are less restrictive than below. The activity must also not require a PCN elsewhere in this document to be SV eligible.

[1] Direct Pull: Each piling is wrapped with a choker cable or chain that is attached at the top to a crane. The crane then pulls the piling directly upward, removing the piling from the sediment. Vibratory Pull: The vibratory hammer is a large mechanical device (5-16 tons) that is suspended from a crane by a cable. The vibrating hammer loosens the piling while the crane pulls up. Clamshell Pull: This can remove intact, broken or damaged pilings. The clamshell bucket is a hinged steel apparatus that operates like a set of steel jaws. The bucket is lowered from a crane and the jaws grasp the piling stub as the crane pulls up. The size of the clamshell bucket is minimized to reduce turbidity during piling removal.
[2] The MA DMF Technical Report TR-47: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/

	TOY Restriction (No work)
Non-tidal Waters	Defer to TR-47
Tidal Waters	January 15 – November 15

Alternate work windows proposed under a PCN will generally be coordinated with the USFWS and NMFS. Resulting written verifications may include species-specific work allowed windows.

21. Heavy Equipment in Wetlands. Operating heavy equipment (drill rigs, fixed cranes, etc.) within wetlands shall be minimized, and such equipment shall not be stored, maintained, or repaired in wetlands, to the maximum extent practicable. Where construction requires heavy equipment operation in wetlands, the equipment shall:

i. Have low ground pressure (typically ≤3 psi);

ii. Be placed on swamp/construction/timber mats (herein referred to as "construction mats" or "mats") that are adequate to support the equipment in such a way as to minimize disturbance of wetland soil and vegetation. See GC 22 for information on the placement of construction mats; or

iii. Be operated on adequately dry or frozen wetlands such that shear pressure does not cause subsidence of the wetlands immediately beneath the equipment and upheaval of adjacent wetlands. Construction mats are to be placed in the wetland from the upland or from equipment positioned on mats if working within a wetland. Dragging construction mats into position is prohibited. Other support structures that are capable of safely supporting equipment may be used with written USACE authorization.

22. Temporary Fill, Work & Construction Mats.

a. *Construction mats in non-tidal waters*: Temporary construction mats shall be in place ≤1 year *and* for one growing season or less to be SV eligible. A PCN is required if construction mats are in place >1 year *or* for more than one growing season. Construction mats can be placed in an area of any size in non-tidal waters. The activity may occur in segments to ensure the requirements for SV above are met, otherwise a PCN is required.

b. *Construction mats in tidal waters*: Temporary construction mats placed in an area <5,000 SF in tidal waters are SV eligible, provided those mats are in place ≤6 months. Temporary construction mats placed in an area ≥5,000 SF or in place >6 months in tidal waters require a PCN.

c. *Management of construction mats:* At a minimum, construction mats shall be managed in accordance with the following construction mat best management practices (BMPs):

1. Mats shall be in good condition to ensure proper installation, use, and removal.
2. As feasible, mats shall be placed in a location that will minimize the amount of mats needed for the wetland crossing(s).
3. Inspect mats prior to their re-use and remove any plant debris. Mats are to be thoroughly cleaned before re-use to prevent the spread of invasive plant species.
4. Impacts to wetland areas shall be minimized during installation, use, and removal of the mats.
5. Adequate erosion & sediment controls shall be installed at approaches to mats to promote a smooth transition to, and minimize sediment tracking onto, the mats.
6. In most cases, mats should be placed along the travel area so that the individual boards are resting perpendicular to the direction of traffic. No gaps should exist between mats. Place mats far enough on either side of the resource area to rest on firm ground.

d. A PCN is required for temporary fills in place >2 years. All temporary fills and disturbed soils shall be stabilized to prevent the material from eroding into waters of the U.S. where it is not authorized. Work shall include phased or staged development to ensure only areas under active development are exposed and to allow for stabilization practices as soon as practicable. Temporary fill must be placed in a manner that will prevent it from being eroded by expected high flows.

e. Activities that require unconfined temporary fill and are authorized for discharge into waters of the U.S. shall consist of material that minimizes effects to water quality.
f. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Materials shall be placed in a location and manner that does not adversely impact surface or subsurface water flow into or out of the wetland. Temporary fill authorized for discharge into wetlands shall be placed on geotextile fabric or other appropriate material laid on the pre-construction wetland grade where practicable to minimize impacts and to facilitate restoration to the original grade. Construction mats are excluded from this requirement.
g. Construction debris and deteriorated materials shall not be located in waters of the U.S.
h. Temporary fills, construction mats, and corduroy roads shall be entirely removed as soon as they are no longer needed to construct the authorized activity and the disturbed areas be restored to pre-construction contours and conditions.
i. Construction equipment, such as temporary barges in tidal waters, shall provide clearance above the substrate to avoid grounding onto the substrate during all tides.

23. Restoration of Wetland Areas.
a. Upon completion of construction, all disturbed wetland areas shall be stabilized with a wetland seed mix or plant plugs containing only plant species native to New England, and be appropriate for site conditions, including salinity and frequency of inundation, and shall not contain any species listed in the “Invasive and Other Unacceptable Plant Species” Appendix K of the New England District “Compensatory Mitigation Standard Operating Procedures” found at https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.
b. The introduction or spread of invasive plant species in disturbed areas shall be prevented and controlled. Equipment shall be thoroughly cleaned before and after project construction to prevent the spread of invasive species. This includes, but is not limited to, tire treads and construction mats.
c. In areas of authorized temporary disturbance, if trees are cut in USACE jurisdiction, they shall be cut at or above ground level and not uprooted in order to prevent disruption of any kind to the wetland soil structure and to allow stump sprouts to revegetate the work area, unless otherwise authorized.
d. Wetland areas where permanent disturbance is not authorized shall be restored to their original condition and elevation, which under no circumstances shall be higher than the pre-construction elevation. Original condition means careful protection and/or removal of existing soil and vegetation, and replacement back to the original location such that the original soil layering and vegetation schemes are approximately the same, unless otherwise authorized.

24. Bank Stabilization.
a. Projects involving construction or reconstruction/maintenance of bank stabilization within USACE jurisdiction shall be designed to minimize environmental effects, effects to neighboring properties, scour, conversion of natural shoreline to hard armoring, etc. to the maximum extent practicable.
b. Projects involving the construction of new bank stabilization within USACE jurisdiction shall use bioengineering techniques and natural materials in the project design to the maximum extent practicable. Use of hard structures shall be eliminated or minimized unless the prospective permittee can demonstrate that use of bioengineering techniques is not practicable due to site conditions.
c. Where possible, bank stabilization projects shall optimize the natural function of the shoreline, including self-sustaining stability to attenuate flood flows, fishery, wildlife habitat and water quality protection, while protecting upland infrastructure from storm events that can cause erosion as well as impacts to public and private property.
d. No material shall be placed in excess of the minimum needed for erosion protection.
e. No material shall be placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas).

f. Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization.
g. The activity must be properly maintained, which may require repairing it after severe storms or erosion events.

25. Soil Erosion and Sediment Controls.
a. Appropriate soil erosion and sediment controls[1] (hereinafter referred to as "controls") must installed prior to earth disturbance and maintained in effective operating condition during construction. Biodegradable wildlife friendly erosion controls should be used whenever practicable to minimize effects to water quality.
b. Activities in streams (rivers, streams, brooks, etc.) and tidal waters that are capable of producing sedimentation or turbidity should be done during periods of low-flow or no-flow, when the stream or tide is waterward of the work area. Controls may also be used to obtain dry work conditions (e.g., coffer dam, turbidity curtain). The prospective permittee must demonstrate in the project plans where the controls are proposed and how these controls would avoid and/or minimize turbidity or sedimentation.
c. A PCN is required for controls that encroach: i) >25% of the stream width measured from OHW in non-tidal diadromous streams from March 15 to June 30; or ii) >25% of the waterway width measured from MHW in tidal waters from Feb. 1 to June 30, or >50% of the waterway width measured from MHW in tidal waters from July 1 to Jan. 14. This is to protect upstream fish passage. Proponents must also maintain downstream fish passage throughout the project.
d. No dewatering shall occur with direct discharge to waters or wetlands. Excess water in isolated work areas shall be pumped or directed to a sedimentation basin, tank or other dewatering structures in an upland area adequately separated from waters or wetlands. Suspended solids shall be removed prior to discharge back into waters or wetlands from these dewatering structures. All discharge points back into waters and wetlands shall use appropriate energy dissipaters and erosion and sedimentation control BMPs.
e. Temporary controls shall be removed upon completion of work, but not until all exposed soil and other fills, as well as any work waterward of OHW or the HTL, are permanently stabilized at the earliest practicable date. Sediment and debris collected by these devices shall be removed and placed at an upland location in a manner that will prevent its later erosion into a waterway or wetland. Controls may be left in place if they are biodegradable and flows and aquatic life movements are not disrupted.

26. Aquatic Life Movements and Management of Water Flows.
a. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies and wetlands shall be:

i. Suitably spanned, bridged, culverted, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species; and
ii. Properly aligned and constructed to prevent bank erosion or streambed scour both adjacent to and inside the crossing.

[1] Appropriate soil erosion, sediment and turbidity controls include cofferdams, bypass pumping around barriers immediately up and downstream of the work footprint (i.e., dam and pump), installation of sediment control barriers (i.e., silt fence, vegetated filter strips, geotextile silt fences, filter tubes, erosion control mixes, hay bales or other devices) downhill of all exposed areas, stream fords, retention of existing vegetated buffers, application of temporary mulching during construction, phased construction, and permanent seeding and stabilization, etc.

b. To avoid adverse impacts on aquatic organisms, the low flow channel/thalweg shall remain unobstructed during periods of low flow, except when necessary to perform the authorized work.
c. For work in tidal waters, in-stream controls (e.g., cofferdams) should be installed in such a way as to not obstruct fish passage.
d. Riprap and other stream bed materials shall be installed in a manner that avoids organism entrapment in rock voids or water displaced to subterranean flow with crushed stone and riprap.
e. To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity shall not restrict or impede the passage of normal or high flows unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

27. Spawning, Breeding, and Migratory Areas.
a. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized under these GPs.
b. Activities in waters of the U.S. that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.
c. The applicant is responsible for obtaining any "take" permits required under the USFWS's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The applicant should contact the appropriate local office of the USFWS to determine if such "take" permits are required for a particular activity.
d. Information on spawning habitat for species managed under the Magnuson-Stevens Fishery Conservation and Management Act (i.e., EFH for spawning adults) can be obtained from NAE Regulatory website, Essential Fish Habitat section, at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.
e. Information regarding diadromous fish habitat can be obtained from the following DMF website at: https://www.mass.gov/info-details/massgis-data-diadromous-fish.

28. Vernal Pools.
a. A PCN is required if a discharge of dredged or fill material is proposed within a vernal pool depression that is also a water of the U.S.
b. Vernal pools must be identified on the plans that show aquatic resource delineations.
c. Adverse impacts to vernal pools shall be avoided & minimized to the maximum extent practicable.

29. Invasive Species.
a. The introduction, spread or the increased risk of invasion of invasive plant or animal species on the project site, into new or disturbed areas, or areas adjacent to the project site caused by the site work shall be avoided. Construction mats shall be thoroughly cleaned before reuse to avoid spread of invasive species.
b. Unless otherwise directed by USACE, all applications for PCN non-tidal projects proposing fill in USACE jurisdiction shall include an Invasive Species Control Plan. Additional information can be found at: https://www.nae.usace.army.mil/Missions/Regulatory/Invasive-Species/, https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/.

30. Fills Within 100-Year Floodplains. The activity shall comply with applicable Federal Emergency Management Agency (FEMA) approved, Massachusetts Emergency Management

Agency (MEMA) approved and/or local floodplain management requirements. Applicants should contact FEMA and/or MEMA regarding floodplain management requirements.

31. Stream Work and Crossings & Wetland Crossings.
a. When feasible, all temporary and permanent crossings of waterbodies and wetlands (hereinafter referred to as "crossings") shall conform to the "Massachusetts River and Stream Crossing Standards" located at: https://www.mass.gov/doc/massachusetts-river-and-stream-crossing-standards/download or https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. Projects that do not conform to these guidelines shall be reviewed under PCN or IP procedures.
b. Crossings shall be suitably culverted, bridged, or otherwise designed to withstand and to prevent the restriction of high flows, to maintain existing low flows, maintain water quality, and not obstruct the movement of aquatic life indigenous to the waterbody beyond the duration of construction.
c. Crossings shall be installed in such a manner as to preserve hydraulic capacity and flow, sediment transport, and organism passage at its present level, between the wetlands on either side of the road. The applicant shall take necessary measures to correct any wetland damage resulting from deficiencies in hydraulic capacity, sediment transport and organism passage.
d. Stream crossings shall utilize a natural mixed grain-size streambed material composition that matches upstream and downstream substrates to create a stable streambed. Substrate should function appropriately during normal and high flows without washing out. If natural streambed material is not utilized, a PCN is required.
e. Activities involving open trench excavation in flowing waters require a PCN. Work should not occur in flowing waters (requires using management techniques such as temporary flume pipes, culverts, cofferdams, etc.). Normal flows should be maintained within the stream boundary's confines when practicable. Projects utilizing these management techniques must meet all applicable terms and conditions of the GP, including the GCs in Section IV.

32. Utility Line Installation and Removal
a. Subsurface utility lines must be installed at a sufficient depth to avoid damage from anchors, dredging, etc., and to prevent exposure from erosion and stream adjustment.
b. When utility lines are installed via horizontal directional drilling, a frac-out contingency plan shall be present on site for the duration of construction. As necessary, the applicant shall immediately contain, control, recover, and remove drilling fluids released into the environment.
c. Abandoned or inactive utility lines must be removed and faulty lines (e.g., leaking hazardous substances, petroleum products, etc.) must be removed or repaired. A written verification from the USACE is required if they are to remain in place, e.g., to protect sensitive areas or ensure safety.
d. Utility lines shall not adversely alter existing hydrology, and trenches cannot be constructed or backfilled in such a manner as to drain waters of the U.S. (e.g., backfilling with extensive gravel layers, creating a French drain effect). In wetland areas, structures such as ditch plugs, cut-off walls, clay blocks, bentonite, or other suitable material shall be used within utility trenches to ensure that the trench through which the utility line is installed does not drain waters of the U.S. including wetlands.
e. Stockpiling of tree debris, to the extent where it has the effect of fill material, shall not occur in waters of the U.S. Tree debris shall be removed from waters of the U.S. and placed in uplands without causing additional disturbance to aquatic resources. Failure to meet this condition could change the bottom elevation of the wetland and be considered a discharge of fill material, and depending on the area of alteration, may require a PCN or IP.

33. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

34. Coral Reefs. Impacts to coral reefs are not authorized under these GPs. Coral reefs consist of the skeletal deposit, usually of calcareous or silicaceous materials, produced by the vital activities of anthozoan polyps or other invertebrate organisms present in growing portions of the reef.

35. Blasting. Blasting in waters of the U.S. associated with work such as dredging, trenching, pile installation, etc. is not authorized under these GPs.

36. Inspections. The permittee shall allow USACE to make periodic inspections at any time deemed necessary to ensure that the work is being or has been performed in accordance with the terms and conditions of this permit. To facilitate these inspections, for activities requiring a PCN, the permittee shall complete and return the Certificate of Compliance when it is provided with a PCN verification letter. For SV-eligible activities, the permittee shall complete and submit the SVN to USACE within 30 days of initiating project construction, at which point, USACE may opt to inspect the activity to verify compliance with the terms and conditions of the GP. Post-construction engineering drawings may be required by USACE for completed work. This includes post-dredging survey drawings for any dredging work.

37. Maintenance. The permittee shall maintain the activity authorized by these GPs in good condition and in conformance with the terms and conditions of this permit. Some maintenance activities may not be subject to federal regulation under Section 404 in accordance with 33 CFR 323.4(a)(2). This condition is not applicable to maintenance of dredging projects. Prospective permittees should contact USACE to inquire about maintenance of dredging projects, and its eligibility under these GPs. Maintenance dredging is subject to the review thresholds in GP #7 as well as any conditions included in a written USACE authorization. Maintenance dredging includes only those areas and depths previously authorized and dredged.

38. Property Rights. Per 33 CFR 320.4(g)(6), these GPs do not convey any property rights, either in real estate or material, or any exclusive privileges, nor do they authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations.

39. Transfer of GP Verifications. When the work authorized by these GPs is still in existence at the time the property is transferred, the terms and conditions of these GPs, including any special conditions, will continue to be binding on the entity or individual who received the GP authorizations, as well as the new owner(s) of the property. If the permittee sells the property associated with a GP authorization, the applicant may transfer the GP authorization to the new owner by submitting a letter to USACE to validate the transfer. A copy of the GP authorization letter must be attached to the letter, and the letter must include the following statement: “The terms and conditions of these general permits, including any special conditions, will continue to be binding on the new owner(s) of the property.” This letter shall be signed by both the seller and new property owner(s).

40. Modification, Suspension, and Revocation. These GPs and any individual authorization issued thereof may be either modified, suspended, or revoked in whole or in part pursuant to the policies and procedures of 33 CFR 325.7; and any such action shall not be the basis for any claim for damages against the U.S.

41. Special Conditions. The USACE may impose other special conditions on a project authorized pursuant to these GPs that are determined necessary to minimize adverse navigational and/or environmental effects or based on any other factor of the public interest. Failure to comply with all conditions of the authorization, including special conditions, constitutes a permit violation and may subject the applicant to criminal, civil, or administrative penalties or restoration.

42. False or Incomplete Information. If USACE makes a determination regarding the eligibility of a project under these GPs, and subsequently discovers that it has relied on false, incomplete, or inaccurate information provided by the applicant, the authorization will not be valid, and the U.S. Government may institute appropriate legal proceedings.

43. Abandonment. If the permittee decides to abandon the activity authorized under these GPs, unless such abandonment is merely the transfer of property to a third party, he/she/they may be required to restore the area to the satisfaction of USACE.

44. Enforcement cases. These GPs do not apply to any existing or proposed activity in USACE jurisdiction associated with an on-going USACE or EPA enforcement action, until such time as the enforcement action is resolved or USACE or EPA determines that the activity may proceed independently without compromising the enforcement action.

45. Previously Authorized Activities.

a. Completed projects that received prior authorization from USACE (SV or PCN), shall remain authorized in accordance with the original terms and conditions of those authorizations, including their terms, GCs, and any special conditions provided in a written verification.

b. Activities authorized pursuant to 33 CFR 330.3 (activities occurring before certain dates) are not affected by these GPs.

46. Duration of Authorization.

These GPs expire on June 1, 2028. Activities authorized under these GPs will remain authorized until the GPs expire, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend, or revoke the authorization in accordance with 33 CFR 325.2(e)(2). Activities authorized under GPs 1-25 that have either commenced (i.e., are under construction) or are under contract to commence in reliance upon this authorization will have until June 1, 2029 to complete the work. If requested by USACE, the permittee shall furnish documentation that demonstrates the project was under construction or under contract to commence by June 1, 2028. If work is not completed before June 1, 2029, the permittee must contact USACE. The USACE may issue a new authorization provided the project meets the terms and conditions of the MA GPs in effect at the time. Activities completed under the SV or PCN authorizations of these GPs will continue to be authorized after their expiration date.

SECTION V: MITIGATION STANDARDS

1. Mitigation Types

For all activities, applicants must (a) demonstrate how the project has been designed to avoid or minimize impacts to aquatic resources; and (b) describe measures taken to avoid or minimize impacts to aquatic resources through construction techniques and/or site access. Please see https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/ for assistance with preparing mitigation in accordance with the 2008 Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (33 CFR 332.3), hereafter referred to as "2008 Mitigation Rule."

Avoidance - Avoidance of impacts (direct and indirect) to aquatic resources means that project activities would not result in the placement of fill material or installation of a structure that could impact the resource area. Avoidance can include, but is not limited to, designing the project to avoid impacts to all or a portion of the aquatic resource areas.

Minimization - Minimization of impacts (direct and indirect) to aquatic resources means that measures are taken to ensure the amount and duration of impacts are limited to the maximum extent practicable. There are many minimization measures that could be implemented, prior to, during, or after the proposed activity, to ensure impacts are minimized. Examples include, but are not limited to:

- Permanent preservation of avoided aquatic features and buffer zone, in perpetuity. In these cases, the preserved area would be under a conservation easement and managed by conservation oriented third-party manager.
- Utilization of best management practices (BMPs) to ensure impacts are limited, and do not result in adverse impacts to the integrity and long-term functions of preserved/avoided features.

Compensatory Mitigation - Compensatory mitigation is generally required for PCN activities in which the impacts to the aquatic resources have been avoided and minimized to the maximum extent practicable but would still result in unavoidable adverse effects to the environment that are considered more than minimal or are contrary to the public interest. *Whatever the case may be, compensatory mitigation is no substitute for avoidance and minimization.*

2. Thresholds for Compensatory Mitigation

The basic objective of compensatory mitigation in the USACE Regulatory Program is to offset environmental losses resulting from unavoidable impacts to waters of the U.S. authorized by Department of the Army permits. **The following compensatory mitigation thresholds apply to all PCN activities that result in loss[1] of the resource area types listed below. Activities[2] in waters of the U.S. associated with the restoration, enhancement, and establishment of tidal and non-tidal aquatic resources are not considered loss and are not subject to the thresholds below.** Thresholds for different resource areas may not be combined to exceed 5,000 SF of total loss of all waters. The USACE will continue to evaluate projects on a case-by-case basis, and may in some cases require compensatory mitigation below these thresholds (e.g. minor impacts that add to a cumulative loss).

[1] See definition of loss in Section VII.
[2] These activities must result in net increases in aquatic resource functions and services to be exempted from the thresholds above.

Compensatory Mitigation Thresholds in Massachusetts		
Resource Area	**Non-Tidal Threshold**	**Tidal Threshold**
Stream	200 LF	200 LF
Bank Stabilization	500 LF	500 LF
Open Water	Project Dependent	Project Dependent
Wetland	5,000 SF	500 SF
Vernal Pool	All	N/A
SAV	Project dependent	25 SF
Mudflat	N/A	1,000 SF
Intertidal	N/A	1,000 SF

These thresholds can be utilized to determine at what point compensatory mitigation is required but are not used to determine how much mitigation may be needed to offset impacts to resources. Per the 2008 Mitigation Rule (33 CFR 332.3(f)(1)) "the amount of required compensatory mitigation must be, to the extent practicable, sufficient to replace lost aquatic resource functions. In cases where appropriate functional or condition assessment methods or other suitable metrics are available, these methods should be used where practicable to determine how much compensatory mitigation is required. If a functional or condition assessment or other suitable metric is not used, a minimum one-to-one acreage or linear foot compensation ratios must be used."

3. Compensatory Mitigation Hierarchy

Compensatory mitigation should follow the hierarchy as outlined in 33 CFR 332.3(b)(2-6) or current regulation. This hierarchy in order of preference includes: (1) Mitigation Bank credits, (2) In-Lieu Fee program credits, (3) permittee-responsible mitigation under a watershed approach, (4) permittee-responsible mitigation through on-site and in-kind mitigation, and (5) permittee-responsible mitigation through off-site and/or out-of-kind mitigation. If the proposed mitigation deviates from this mitigation hierarchy, the applicant **must** justify in writing why the proposed mitigation is environmentally preferable to the preferred method of compensatory mitigation (See 2008 Mitigation Rule). **In order for your application to be considered complete, you must provide a statement that discusses how your project will compensate for the loss or impact to aquatic resources.** If you are proposing permittee responsible mitigation, the 12 components of a mitigation plan (33 CFR 332.4(c)(2-14) must be addressed for your application to be considered complete. Prospective applicants are encouraged to contact USACE with questions at any time. Addressing the 12 components of a mitigation plan is commensurate with the amount of compensatory mitigation required, and USACE can assist prospective applicants with the level of information needed to satisfy each component.

For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee.

4. In-Lieu Fee (ILF)

The purchase of credits from the Massachusetts In-Lieu Fee Program (MA ILFP) is the ***preferred*** method of compensatory mitigation in Massachusetts since, as of the issuance date of this GP, there are no mitigation banks available in Massachusetts. The applicant shall develop a mitigation plan that addresses the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).

The MA ILFP is administered by the Massachusetts Department of Fish & Game (DFG) in accordance with the 2008 Mitigation Rule at 33 CFR 332. The Mitigation Rule governs in-lieu fee compensatory mitigation associated with USACE permits under §404 of the Clean Water Act and/or §9 or §10 of the Rivers and Harbors Act of 1899.

MA ILFP Website: https://www.mass.gov/in-lieu-fee-program

Acceptance of an ILF payment into the ILFP established by the 2014 MA ILFP Instrument (link below) is an acknowledgement by DFG that it assumes all legal responsibility for satisfying the mitigation requirements of the USACE (i.e., the implementation, performance, and long-term management and monitoring of the compensatory mitigation project(s) approved under this Instrument and subsequent Compensatory Mitigation Plans). This transfer of legal responsibility is established by: 1) the approval of this In-Lieu Fee Instrument; 2) receipt by the district engineer of a Notice of Credit Sale and Transfer of Legal Responsibility to DFG that is signed by the DFG and the permittee and dated; and 3) the transfer of fees from the permittee to DFG.

MA ILFP Fact Sheet: https://www.mass.gov/files/documents/2017/01/sj/ilfp-fact-sheet-ma-ilfp-fees.pdf

MA ILFP Instrument: https://www.mass.gov/files/documents/2016/08/nd/ilfp-final-instrument-dfg.pdf

5. Permittee-Responsible

The USACE may determine that the proposed permittee-responsible compensatory mitigation is appropriate on a case-by-case basis. As described in the Compensatory Mitigation Hierarchy section above, applicants must justify in writing why the proposed mitigation is environmentally preferable to the purchase of ILF credits. Applicants are encouraged to contact the USACE prior to submission of a permit application to seek further guidance regarding USACE mitigation requirements.

Applicants will demonstrate their proposed compensatory mitigation in writing by addressing the 12 components of a mitigation plan (33 CFR 332.4(c)(2-14). *Please note that all elements must be addressed, or the permit application will be deemed incomplete.* In certain circumstances, the district engineer may determine that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). Guidance on how to address these components can be found on the New England District Mitigation webpage: https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/

Performance standards will be used to measure the successfulness of the mitigation project. A successful mitigation project is one that is self-sustaining. For a mitigation project that will restore, enhance, or create wetlands, proper performance standards must address hydrology, hydric soils, and hydrophytic vegetation. The mitigation proposal must include an explanation of quantitative methods used to measure the success of performance standards (i.e., percent cover may be measured using vegetation plots, hydrology may be measured using data loggers, soil cores may be taken and evaluated for hydric soil indicators).

Monitoring methods should include quantitative sampling methods following established, scientific protocols. Sampling documentation, as part of monitoring reports, should include maps and coordinates (also shapefiles, if available) showing locations of sampling points, transects, quadrats, etc. In addition, permanent photo stations should be established coincident with sampling locations.

SECTION VI: FEDERAL & STATE AGENCY CONTACT INFORMATION & ORGANIZATIONAL WEBSITES

Federal Agencies

U.S. Army Corps of Engineers
Regulatory Division
696 Virginia Road
Concord, Massachusetts 01742-2751
(978) 318-8338 (phone); (978) 318-8303 (fax)
www.nae.usace.army.mil/missions/regulatory

U.S. Army Corps of Engineers
Navigation Division – Section 408
696 Virginia Road
Concord, Massachusetts 01742-2751
See link below for contact information:
https://www.nae.usace.army.mil/Missions/Section-408/

National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930
(978) 281-9300 (phone)
(*Federal endangered species & EFH)*

U.S. Fish & Wildlife Service
70 Commercial Street, Suite 300
Concord, New Hampshire 03301
(603) 223-2541 (phone)
(Federal endangered species)

National Park Service
15 State Street
Boston, Massachusetts 02109
(617) 223-5191 (phone)
(*Wild and Scenic Rivers*)

Bureau of Ocean and Energy Management
1849 C Street, NW
Washington D.C. 20240
202-208-6474 (phone)
(*Offshore Wind Facilities)*

Chief, Risk Analysis Branch
FEMA Region 1
99 High Street, 6th Floor
U.S. Department of Homeland Security
Boston, Massachusetts 02110
(617) 956-7576 (phone)

Commander (dpb)
First Coast Guard District
Battery Building
One South Street
New York, New York 10004-1466
(212) 514-4331 (phone); (212) 514-4337 (fax)
(*Bridge permits*)

U.S. Environmental Protection Agency
5 Post Office Square
Suite 100 (OEP06–3)
Boston, Massachusetts 02109-3912
(617) 918-1692 (phone)

State Agencies in Massachusetts

Massachusetts Department of Environmental Protection (MassDEP)	
DEP Division of Wetlands & Waterways	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 292-5695
Northeast Region	150 Presidential Way, Suite 300 Woburn, Massachusetts 01801 (978) 694-3200
Southeast Region	20 Riverside Drive, Route 105 Lakeville, Massachusetts 02347 (508) 946-2800
Central Region	8 New Bond Street Worcester, Massachusetts 01606 (508) 792-7650
Western Region	436 Dwight Street Springfield, Massachusetts 01103 (413) 784-1100

Massachusetts Office of Coastal Zone Management (CZM) Emails may be sent to: czm@mass.gov	
MA Office of Coastal Zone Management	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 626-1200
North Shore Region	2 State Fish Pier Gloucester, Massachusetts 01930 (978) 281-3972
South Shore Region	175 Edward Foster Road Scituate, Massachusetts 02066
Cape Cod and Islands Region	3195 Main Street, P.O. Box 220 Barnstable, MA 02630
South Coastal Region	81-B County Road, Suite E Mattapoisett, MA 02739

Massachusetts Historical Commission (MHC)	
Office Location:	220 Morrisey Boulevard Boston, Massachusetts 02125 (617) 727-8470

Massachusetts Board of Underwater Archaeological Resources (BUAR) Emails may be sent to: david.s.robinson@mass.gov	
Office Location:	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 626-1014

SECTION VII: Definitions & Acronyms

Artificial or Living Reef: A structure which is constructed or placed in waters for the purpose of enhancing fishery resources and commercial and recreational fishing opportunities.
Attendant Features: Occurring with or as a result of; accompanying.
Biodegradable: A material that decomposes into elements found in nature within a reasonably short period of time and will not leave a residue of plastic or a petroleum derivative in the environment after degradation. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Examples of biodegradable materials include jute, sisal, cotton, straw, burlap, coconut husk fiber (coir) or excelsior. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Photodegradable, UV degradable or Oxo-(bio)degradable plastics are not considered biodegradable under this GP.
Boating facilities: These provide, rent or sell mooring space, such as marinas, yacht clubs, boat yards, dockominiums, municipal facilities, land/home owners, etc. Not classified as boating facilities are piers shared between two abutting properties or municipal mooring fields that charge an equitable user fee based on the actual costs incurred.
Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. Must comply with the applicable provisions of 33 CFR 332. See also the New England District Compensatory Mitigation Guidance at http://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.
Construction mats: Constructions, swamp and timber mats (herein referred to as “construction mats”) are generic terms used to describe structures that distribute equipment weight to prevent wetland damage while facilitating passage and providing work platforms for workers and equipment. They are comprised of sheets or mats made from a variety of materials in various sizes. A timber mat consists of large timbers bolted or cabled together. Corduroy roads, which are not considered to be construction mats, are cut trees and/or saplings with the crowns and branches removed, and the trunks lined up next to one another. Corduroy roads are typically installed as permanent structures. Like construction mats, they are considered as fill whether they are installed temporarily or permanently.
Cumulative Impacts: The impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.1). Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems. See 40 CFR 230.11(g).
Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.
Dredging:
Improvement Dredging: For the purposes of these GPs, this is dredging deeper than previously authorized by the USACE and dredged under that authorization.
Maintenance Dredging: For the purposes of these GPs, this is dredging from an area previously authorized by the USACE and dredged under that authorization. The USACE may require proof of authorization and dredging. Maintenance dredging typically refers to the routine removal of accumulated sediment to maintain the design depths of serviceable navigation channels, harbors, marinas, boat launches and port facilities. Maintenance dredging is conducted for navigational purposes and does not include any expansion of the previously dredged area. The USACE may

review a maintenance dredging activity as new dredging if sufficient time has elapsed to allow for the colonization of SAS, shellfish, etc.

New Dredging: For the purposes of these GPs, this is a) first time the USACE authorizes dredging of a particular location or b) dredging has not occurred for an extended period of time, and this has allowed for aquatic resources (i.e., eelgrass, shellfish, etc.) to redevelop in the area.

Dredged material & discharge of dredged material: These are defined at 33 CFR 323.2(c) and (d). The term dredged material means material that is excavated or dredged from waters of the U.S.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s) but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: A stream with flowing water only during, and for a short duration, after precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Erosion Controls: Appropriate soil erosion, sediment and turbidity controls include cofferdams, bypass pumping around barriers immediately up and downstream of the work footprint (i.e., dam and pump), installation of sediment control barriers (i.e., silt fence, vegetated filter strips, geotextile silt fences, filter tubes, erosion control mixes, hay bales or other devices) downhill of all exposed areas, stream fords, retention of existing vegetated buffers, application of temporary mulching during construction, phased construction, and permanent seeding and stabilization, etc.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area (33 CFR 332.2).

Expansions: Work that increases the footprint of fill, structures, depth of basin or drainage features, or floats, or slip capacity.

Essential Fish Habitat (EFH): The Federal Magnuson-Stevens Fishery Management and Conservation Act broadly defines EFH to include those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. See www.greateratlantic.fisheries.noaa.gov/habitat for more information.

Fill material & discharge of fill material: Material placed in waters of the U.S. where the material has the effect of either replacing any portion of a water of the U.S. with dry land or changing the bottom elevation of any portion of a water of the U.S. Fill material does not include any pollutant discharged into the water primarily to dispose of waste. These are defined at 33 CFR 323.2 (e) & (f).

Federal navigation projects (FNPs): These areas are maintained by the USACE; authorized, constructed and maintained on the premise that they will be accessible and available to all on equal terms; and comprised of USACE Federal anchorages, Federal channels and Federal turning basins. The buffer zone is equal to three times the authorized depth of a FNP. The following are FNPs in MA and more information, including the limits, is provided at www.nae.usace.army.mil/missions/navigation >> Navigation Projects:

- Andrews River, Harwich, MA
- Aunt Lydia's Cove
- Beverly Harbor
- Boston Harbor
- Buttermilk Bay Channel
- Canapitsit Channel
- Cape Cod Canal
- Chatham Harbor
- Cohasset Harbor
- Cross Rip Shoals, Nantucket Sound
- Cuttyhunk Harbor
- Dorchester Bay and Neponset River
- Duxbury Harbor
- Edgartown Harbor
- Essex River
- Fall River Harbor
- Falmouth Harbor
- Gloucester Harbor and Annisquam River
- Green Harbor
- Hingham Harbor
- Hyannis Harbor
- Ipswich River
- Island End River (Chelsea, MA)
- Kingston Harbor
- Lagoon Pond
- Little Harbor Woods Hole

Lynn Harbor
Malden River
Menemsha Creek
Merrimack River
Mystic River
Nantucket Harbor of Refuge
New Bedford and Fairhaven Harbor
Newburyport Harbor
Oak Bluffs Harbor
Pigeon Cove Harbor
Plymouth Harbor
Pollock Rip Shoals, Nantucket Sound
Provincetown Harbor
Red Brook Harbor
Rockport Harbor
Salem Harbor
Sandy Bay Harbor of Refuge
Saugus River
Scituate Harbor
Sesuit Harbor
Taunton River
Vineyard Haven Harbor
Wareham Harbor
Wellfleet Harbor
Westport River and Harbor
Weymouth Back River
Weymouth Fore and Town Rivers
Winthrop Harbor
Woods Hole Channel

Flume: An open artificial water channel, in the form of a gravity chute, which leads water from a diversion dam or weir alongside a natural flow. A flume can be used to measure the rate of flow.
FNP buffer zone: The buffer zone of a USACE Federal Navigation Project (FNP) is equal to three times the authorized depth of the FNP.
Frac out: During horizontal directional drilling (HDD) operations, drilling fluid travels up the borehole into a pit. When the borehole becomes obstructed or the pressure becomes too great inside the borehole, the ground fractures and fluid escapes to the surface and may affect surface waters.
Ground disturbance: Any activity that compacts, relocates, overturns, removes, mixes, or otherwise disturbs the ground, including under water. Ground disturbance can be caused by the use of hand tools (shovels, pick axe, posthole digger, etc.), heavy equipment (excavators, backhoes, bulldozers, dredgers, trenching and earthmoving equipment, etc.), and heavy trucks (large four wheel drive trucks, dump trucks and tractor trailers, etc.). Trenching, bulldozing, dredging, excavating, scraping, and plowing are typical examples of ground disturbance activities.
Height:width ratio: The height of structures shall at all points be equal to or exceed the width of the deck. For the purpose of this definition, height shall be measured from the marsh substrate to the bottom of the longitudinal support beam.
High Tide Line (HTL): The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides 58 that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds. (33 CFR 328). Refer to the highest predicted tide for the current year at the nearest NOAA tide gage. https://tidesandcurrents.noaa.gov/map/index.html
Historic Property: Any prehistoric or historic site (including archaeological sites), district, building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).
Impacts:
Direct Impacts: Effects that are caused by the activity and occur at the same time and place (40 CFR 1508.7).
Indirect impacts: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.
Secondary impacts: Effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.

Information about secondary effects on aquatic ecosystems shall be considered prior to the time final section 404 action is taken by permitting authorities. Some examples of secondary effects on an aquatic ecosystem are: aquatic areas drained, flooded, fragmented; fluctuating water levels in an impoundment and downstream associated with the operation of a dam; septic tank leaching and surface runoff from residential or commercial developments on fill; and leachate and runoff from a sanitary landfill located in waters of the U.S. See 40 CFR 230.11(h).

Incidental Fallback: Incidental fallback is the redeposit of small volumes of dredged material that is incidental to excavation activity in waters of the U.S. when such material falls back to substantially the same place as the initial removal (33 CFR 323.2(d)(2)(iii)).

In the dry: Work that is done under dry conditions, e.g., work behind cofferdams or when the stream or tide is waterward of the work.

Independent utility: A test to determine what constitutes a single and complete non-linear project in the USACE Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Individual permit: A Department of the Army authorization that is issued following a case-by-case evaluation of a specific structure or work in accordance with the procedures of 33 CFR 322, or a specific project involving the proposed discharge(s) in accordance with the procedures of 33 CFR 323, and in accordance with the procedures of 33 CFR 325 and a determination that the proposed discharge is in the public interest pursuant to 33 CFR 320.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Intertidal: The area in between mean low water and the high tide line.

Living reef: See the definition of “artificial or living reef.”

Living shoreline: A term used to describe a low-impact approach with a substantial biological component to shoreline protection and restoration along coastal shores, riparian zones, lacustrine fringe wetlands, or oyster or mussel reef structures. This approach integrates natural features to restore, enhance, maintain, or create habitat, functions, and processes while also functioning to mitigate flooding or shoreline erosion. Living shorelines may stabilize banks and shores with small fetch and gentle slopes that are subject to low-to mid-energy waves. A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural “soft” elements alone or in combination with some type of harder shoreline structure (e.g., oyster or mussel reefs or rock sills) for added protection and stability. Living shorelines should maintain the natural continuity of the land-water interface and retain or enhance shoreline ecological processes.

Loss of waters of the United States: Waters of the U.S. that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. The loss of stream bed includes the acres of stream bed that are permanently adversely affected by filling or excavation because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the U.S. is a threshold measurement of the impact to jurisdictional waters or wetlands for determining whether a project may qualify for a GP; it is not a net threshold that is calculated after considering compensatory mitigation that maybe used to offset losses of aquatic functions and services. Waters of the U.S. temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the U.S. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the U.S.

Maintenance: The repair, rehabilitation, or in-kind replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3 – "Activities occurring before certain dates," provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Maintenance includes minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards that are necessary to make repair, rehabilitation, or replacement are authorized. Currently serviceable means useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.
Maintenance Exemption: In accordance with 33 CFR 323.4(a)(2), any discharge of dredged or fill material that may result from any of the following activities is not prohibited by or otherwise subject to regulation under Section 404 of the CWA: "Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design."
Mean high water: Line on the shore reached by the plane of the average high water. Where precise determination of the actual location of the line becomes necessary, it must be established by survey with reference to the available tidal datum, preferably averaged over a period of 18.6 years. Less precise methods, such as observation of the "apparent shoreline" which is determined by reference to physical markings, lines of vegetation, or changes in type of vegetation, may be used only where an estimate is needed of the line reached by the mean high water.
Mechanized land clearing: Land clearing activities using mechanized equipment such as backhoes or bulldozers with sheer blades, rakes or discs constitute point source discharges and are subject to section 404 jurisdiction when they take place in wetlands or waters of the U.S (Regulatory Guidance Letter 90-05).
Metallic mineral: Any ore or material to be excavated from the natural deposits on or in the earth for its metallic mineral content to be used for commercial or industrial purposes. "Metallic mineral" does not include thorium or uranium.
Minor deviations: Deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards, which are necessary to make repair, rehabilitation, or replacement are permitted, provided the adverse environmental effects resulting from such repair, rehabilitation, or replacement are minimal.
Natural Rocky Habitats: Intertidal and subtidal substrates of pebble-gravel, cobble, boulder, or rock ledge and outcrops. Manufactured stone (e.g., cur or engineered riprap) is not considered a natural rocky habitat. Natural rocky habitats are either found as pavement (consolidated pebble-gravel, cobble, or boulder areas) or as a mixture with fines (i.e., clay and sand) and other substrates. Rocky habitats as EFH are defined as follows: (1) All pebble-gravel, cobble, or boulder pavements; (2) Pebble-gravel mixed with fines: mixed substrate of pebble-gravel and fines where pebble-gravel is an evident component of the substrate (either through visual observation or within sediment samples). Sediment samples with a content of 10% or more of pebble-gravel in the top layer (6-12 inches) should be delineated; (3) Scattered cobble, scattered boulder, scattered cobble/boulder: mixed substate of cobble and/or boulder and other substrates. The aerial extent of cobbles and/or boulders should be delineated; and (4) All rock ledge outcrops: area should be delineated along the edge of the ledge/outcrop (as defined by NMFS Habitat and Ecosystems Services Branch, Gloucester, MA).
Navigable waters or Navigable waters of the U.S.: These waters are subject to section 10 of the Rivers and Harbors Act of 1899 and are defined as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce (33 CFR Part 329). Work or structures in navigable

waters require permits pursuant to §9 and §10 of the Rivers and Harbors Act of 1899. Also see the definition of “waters of the U.S.” below.
Note: Currently the following non-tidal waters have been determined to be navigable waters of the U.S. subject to permit jurisdiction in Massachusetts: Merrimack River, Connecticut River, and Charles River to the Watertown Dam.
Nearshore disposal: This is defined in the USACE Coastal Engineering Manual as “(1) In beach terminology an indefinite zone extending seaward from the shoreline well beyond the breaker zone. (2) The zone which extends from the swash zone to the position marking the start of the offshore zone, typically at water depths of the order of 20m.” A nearshore berm is an artificial berm built in shallow water using dredged material. Often, the berm is intended to renourish the adjacent and downdrift shore over time under the influence of waves and currents.
Non-regulated activity: Only structures or fills that were previously authorized and are in compliance with the terms and condition of the original authorization can be maintained as a non-regulated activity under 33 CFR 323.4(a)(2). Minor deviations from the previously authorized footprint do not qualify as a non-regulated activity and require new authorization from the USACE. The state’s maintenance provisions may differ from the USACE and a project may require reporting and written authorization from the state.
Non-tidal wetlands: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the HTL (*i.e.,* spring HTL). Also see the definition of “Waters of the U.S.” below.
Oil or natural gas pipeline: Any pipe or pipeline for the transportation of any form of oil or natural gas, including products derived from oil or natural gas, such as gasoline, jet fuel, diesel fuel. heating oil, petrochemical feedstocks, waxes, lubricating oils, and asphalt.
Ordinary High Water Mark (OHWM): A line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas. See 33 CFR 328.3(e).
Overall project: The overall project, for purposes of these GPs, includes all regulated activities that are reasonably related and necessary to accomplish the project purpose. Also see the definition of “single and complete linear project.”
Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.
Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.
Permanent impacts: Permanent impacts means waters of the U.S. that are permanently affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent impacts include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody.
Preconstruction notification (PCN): A request submitted by the applicant to the USACE for confirmation that a particular activity is authorized by these GPs. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Preconstruction notification may be required by the terms and conditions of these GPs. A PCN may be voluntarily submitted in cases where PCN is not required and the applicant wants confirmation that the activity is authorized under these GPs.
Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions (33 CFR 332.2).
Real estate subdivision: Includes circumstances where a landowner or developer divides a tract of land into smaller parcels for the purpose of selling, conveying, transferring, leasing, or

developing said parcels. This would include the entire area of a residential, commercial or other real estate subdivision, including all parcels and parts thereof

Reconfiguration zone: A USACE authorized area in which permittees may rearrange pile-supported structures and floats without additional authorizations. A reconfiguration zone does not grant exclusive privileges to an area or an increase in structure or float area.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/ historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in again in aquatic resource area and functions (33 CFR 332.2).

Reference Site: Reference sites - Compensatory restoration, rehabilitation, and creation mitigation projects should seek to duplicate the features of reference aquatic resources or enhance connectivity with adjacent natural upland and aquatic resource landscape elements. Performance standards related to reference sites are encouraged. Mitigation project sites must be selected based on their ability to be, and continue to be, resistant to disturbance from the surrounding landscape, by locating them adjacent to refuges, buffers, green spaces, and other preserved natural elements of the landscape. In general, aquatic resource mitigation projects must be designed to be self-sustaining, natural systems within the landscape and climate in which they are located, with little or no ongoing maintenance and/or hydrologic manipulation.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area (33 CFR 332.2).

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation (33 CFR 332.2).

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Sedimentation: Sedimentation is defined as the process of deposition of a solid material from a state of suspension. Deposited sediments may accumulate and have temporal impacts to aquatic resource areas. See secondary effects definition above. For the purposes of this document, “greater than minimal sedimentation” is generally not considered to occur when using proper erosion controls (GC 25) or when sedimentation is considered “de minimis” 33 CFR 323.2(d)(5).

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term “single and complete project” is defined as that portion of the total linear project proposed or accomplished by one owner/ developer or partnership or other association of owners/developers that includes all crossings of a single water of the U.S. (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for the purposes of these GPs. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term “single and complete project” is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete

non-linear project must have independent utility (see the definition of “independent utility”). Single and complete non-linear projects may not be “piecemealed” to avoid the limits in a GP authorization.
Special aquatic sites (SAS): These include inland and saltmarsh wetlands, mud flats, vegetated shallows, sanctuaries and refuges, coral reefs, and riffle and pool complexes. These are defined at 40 CFR 230.3 and listed in 40 CFR 230 Subpart E.
Streambed: The stream substrate between the OHW marks on each side. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the streambed, but outside of the OHW marks, are not considered part of the streambed.
Stream channelization: The manipulation of a stream’s course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the U.S.
Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.
Temporal loss: The time lag between the loss of aquatic resource functions caused by the permitted impacts and the replacement of aquatic resource functions at the compensatory mitigation site(s) (33 CFR 332.2).
Temporary impacts: Temporary impacts include, but are not limited to, jurisdictional waters that are temporarily filled, flooded, excavated, or drained because of the regulated activity. Impacts are considered temporary when they are removed immediately upon completion of the activity. Note: An impact is considered temporary when the aquatic resource is restored to pre-project conditions, but effects to archaeological and/or cultural resources may be permanent in duration.
Tidal wetlands: A wetland that is subject to the ebb and flow of the tide. See the definition of “Waters of the U.S.” below.
Tide gates: Structures such as duckbills, flap gates, manual and self-regulating tide gates, etc. that regulate or prevent upstream tidal flows.
Turbidity: A measure of the level of particles such as sediment, plankton, or organic by-products, in a body of water. As the turbidity of water increases, it becomes denser and less clear due to a higher concentration of these light-blocking particles. Suspended solids are more likely to carry toxic chemicals, and can also negatively affect aquatic organisms, water temperature, and dissolved oxygen levels.
Utility line: Any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose that is not oil, natural gas, or petrochemicals. A utility line also includes any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and radio and television communication. The term ‘utility line’ does not include activities that drain a water of the U.S., such as drainage tile or French drains, but it does apply to pipes conveying drainage from another area.
Vegetated shallows: Permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation, such as eelgrass *(Zostera marina)* and widgeon grass (*Rupia maritima*) in marine systems (does not include salt marsh) as well as a number of freshwater species in rivers and lakes. These are a type of SAS defined at 40 CFR 230.43. Vegetated shallows are commonly referred to as submerged aquatic vegetation or SAV. Vegetated shallow survey guidance is located at www.nae.usace.army.mil/missions/regulatory /jurisdiction-and-wetlands. Maps of vegetated shallows in Massachusetts are located at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
Vernal pools: For the purposes of these GPs, vernal pools are depressional wetland basins that typically dry up in most years and may contain inlets or outlets, typically of intermittent flow. Vernal pools range in both size and depth depending upon landscape position and parent material(s). In

most years, vernal pools support one or more of the following obligate indicator species: wood frog, spotted salamander, blue-spotted salamander, marbled salamander, Jefferson's salamander and fairy shrimp. However, they should preclude sustainable populations of predatory fish.

Water diversions: Water diversions are activities such as bypass pumping (e.g., "dam and pump") or water withdrawals. Temporary flume pipes, culverts or cofferdams where normal flows are maintained within the stream boundary's confines aren't water diversions. "Normal flows" are defined as no change in flow from pre-project conditions.

Waters of the United States (U.S.) These waterbodies are the waters where permits are required for the discharge of dredged or fill material pursuant to §404 of the CWA. These waters include but are not limited to navigable waters of the U.S. and tidal wetlands and include many non-tidal wetlands and other waterbodies. See definitions for navigable waters of the U.S., tidal wetlands, waterbody, and non-tidal wetlands. (33 CFR 328)

Waterbody: Examples of "waterbodies" include oceans, coastal waters, rivers, streams, ditches, lakes, ponds, and wetlands. If a wetland is adjacent to a waterbody determined to be a water of the U.S., that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)).

Weir: A barrier across a river designed to alter the flow characteristics. In most cases, weirs take the form of a barrier, smaller than most conventional dams, across a river that causes water to pool behind the structure and allows water to flow over the top. Weirs are commonly used to alter the flow regime of a river, prevent flooding, measure discharge and help render a river navigable.

Wetland: Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. The Corps of Engineers Wetlands Delineation Manual in conjunction with the associated regional supplement should be used to determine if a wetland is present and delineate wetland boundaries.

Acronyms

BMPs	Best Management Practices
BUAR	Massachusetts Board of Underwater Archaeological Resources
CWA	Clean Water Act
CZM	Coastal Zone Management
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EFH	Essential Fish Habitat
FNP	Federal Navigation Project
GC	General Condition
GP	General Permit
HTL	High Tide Line
IP	Individual Permit
LID	Low impact development
MassDEP	Massachusetts Department of Environmental Protection
MA DMF	Massachusetts Division of Marine Fisheries
MHC	Massachusetts Historical Commission
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
OHW	Ordinary High Water Mark
PCN	Preconstruction Notification
SAS	Special Aquatic Sites
SF	Square Feet
SV	Self-Verification
SHPO	State Historic Preservation Officer
THPO	Tribal Historic Preservation Officer
USFWS	U.S. Fish and Wildlife Service
USCG	U.S. Coast Guard
USFS	U.S. Forest Service
USGS	U.S. Geological Service
WQC	Water Quality Certification

Appendix A: Guidance for NHPA Section 106 Compliance in Massachusetts

1. Purpose & Applicability

Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) (54 U.S.C § 306108), requires Federal agencies to take into account the effects of their undertakings on Historic Properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. Therefore, in order for an activity to be eligible for authorization under the 2023 Massachusetts General Permit, the USACE must consider the effect the activity may have on historic properties. Historic properties may include, but are not limited to, historic districts, archaeological districts, sites, buildings, structures, objects, sacred sites, traditional cultural places, and traditional cultural landscapes that are included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

This guidance applies to projects that require authorization under Section 404 of the Clean Water Act (33 U.S.C. § 1344) and/or Section 10 of the Rivers and Harbors Act (33 U.S.C. §403) and will assist applicants when evaluating and documenting the presence of historic properties within or near their project site(s). The prospective applicant will evaluate their proposed project using the criteria below to determine if their project has the potential to affect historic properties and if so, whether or not historic properties are present or are likely to be present. All activities authorized under these GPs shall follow the terms outlined in General Condition 14: Historic Properties and General Condition 6: Tribal Rights & Burial Sites. Prospective applicants shall complete their due diligence according to the procedures below for their application to be deemed complete.

2. No Potential to Affect Historic Properties

Certain activities do not have the potential to cause effects on historic properties, assuming such historic properties were present, based on the nature of the activity and site-specific conditions. Therefore, these activities **do not** require historic property identification efforts or notification of the SHPO, THPOs, and/or BUAR under Section 106. The USACE has determined the following activities within the stated parameters have no potential to affect historic properties:

General Permit	Activity Parameters
1	Temporary buoys, markers and similar structures that are placed during winter events on ice and removed before spring thaw.
2	Repair or rehabilitation of structures that are less than 45 years in age. Any temporary structures or fills or work necessary to complete repairs or rehabilitation must not result in any ground disturbance.
3	Maintenance and replacement of moorings that are less than 45 years in age.
6	Maintenance, repair, replacement, or removal of utility lines, oil or natural gas pipelines, outfall or intake structures, and/or appurtenant features that are less than 45 years in age when all access, staging, and ground disturbance is strictly limited to previously disturbed areas (including any previous ground disturbance). Replacement must be in kind or smaller in size. Installation of tide gates on outfall structures that are less than 45 years in age.
7	Maintenance dredging of previously dredged areas where dredging does not extend beyond the original bottom elevations.

	Disposal of dredged material at an existing established and USACE-approved confined aquatic disposal cell. Beach nourishment in ongoing existing nourishment areas.
11	Fish and wildlife harvesting and attraction devices and activities.
13	Cleanup of hazardous and toxic waste materials, including contaminated sediments, that are less than 45 years in age.
16	Removal of land-based and water-based renewable energy generation facilities and hydropower projects that are less than 45 years in age.
18	Installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures for previously authorized by the USACE and ongoing aquaculture activities. Discharges of dredged or fill material into tidal or non-tidal waters necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities for previously authorized and ongoing aquaculture activities.
20	Maintenance activities for existing living shorelines excluding maintenance activities that require new ground disturbance such as excavation or re-sloping of the bank/shoreline.
22	Reshaping or maintenance of existing drainage ditches less than 45 years in age excluding ditch enlargement.
23	Placement of temporary and removable linear transportation and wetland/stream crossings that have no ground disturbance prior to placement, during placement, and during removal (i.e., placed on the surface and subsequently removed within one year of placement).
24	Placement of temporary and removable crossings and cofferdams that have no ground disturbance prior to placement, during placement, and during removal (i.e., placed on the surface and subsequently removed within one year of placement).
25	Emergency repair of existing structures and/or fills less than 45 years in age.

3. Historic Property Identification

If the activity does not fit under the criteria above, the following historic property identification efforts must be completed to demonstrate compliance with Section 106 of the NHPA. This includes documenting previously identified and unidentified historic properties in the project area.

a. Previously Identified Historic Properties: The prospective applicant shall document if previously identified historic properties are present on or adjacent to the project site by notifying the Massachusetts Historical Commission (MHC) and the Massachusetts Board of Underwater Archaeological Resources (BUAR), as appropriate, of the proposed project. The MHC and BUAR will check their records for the presence of any previously identified historic properties. The following outlines how prospective applicants should notify the MHC and BUAR.

i. The prospective applicant will notify the SHPO and BUAR to identify any previously recorded cultural resources. Applicants shall mail a completed Project Notification Form[18], project narrative, location (coordinates), plans, soil maps, and information on known cultural resources to the MHC. The MHC does not accept submissions via email. Applicants shall email or mail this information to the BUAR when the activity is located in lakes, ponds, rivers, and/or navigable waters in MA. Emailed file attachments should be <10MB. Any files >10MB shall be delivered via a file exchange system or the hard copy documents shall be mailed. Preferred contact information is listed below.

ii. **When sending this information, applicants must also document proof of receipt OR proof the information was delivered.** Proof of receipt constitutes a certified mail receipt, read email receipt, or other mail/email/online tracking services that document the information has reached the intended recipient(s). Proof the information was delivered constitutes a certificate of mailing, email delivery receipt, or other mail/email/online services that document the information was sent at a particular time. When using proof of delivery such (e.g., certificate of mailing), applicants should add 5 days to the 30-day notification period so the mail has time to reach its intended recipient. When using proof of receipt, the applicant may begin the 30-day notification period from the date received by the intended recipient.

iii. When mailing or emailing the application materials, applicants should include the following statement: “Please send responses to this notification directly to the USACE via email: cenae-r-ma@usace.army.mil or address regular mail responses to: Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, Massachusetts 01742-2751.” Email responses to the USACE are strongly preferred. The SHPO and BUAR will contact the USACE and cc the applicant(s) within 30 days of receiving the notification if their records indicate that historic properties are located in the project vicinity, and if additional review and/or surveys are recommended to ensure NHPA compliance. If the SHPO and/or BUAR do not respond within 30 days of receiving the notification, is it presumed that no known historic properties are present.

b. Previously Unidentified Historic Properties: The prospective applicant shall evaluate the project site and determine the sensitivity for the presence of historic properties if the project site has not been previously surveyed for cultural resources within the last 10 years. If the sensitivity is determined to be moderate to high, an intensive archaeological and/or architectural survey is required to investigate the potential presence of historic properties. The individual conducting this survey must meet the Secretary of the Interior’s Standards for Professional Qualifications (48 FR 44738-44739) in the discipline relevant to a particular resource type. For example, archeologists should not document and evaluate buildings or structures and architectural historians should not document and evaluate archaeological sites. The identification and qualifications for those participating in any survey and evaluation of resources should be included with the survey results. The criteria listed below are indicators of low sensitivity for the presence of historic properties for consideration when determining if an archaeological or architectural survey is needed.

Low sensitivity indicators:

- Previous archaeological and/or architectural survey within the last 10 years with negative results.
- In a location created in modern times (i.e., built on fill placed within the last 45 years or within an area excavated within the last 45 years).
- USACE has reviewed the project description and determined that a survey is not warranted based on the proposed activity and its location.

State survey guidance and standards are provided in the September 1995 Historic Properties Survey Manual Guidelines for the Identification of Historical and Archaeological Resources in Massachusetts available. State survey guidance and standards for underwater surveys are provided

[18] https://www.sec.state.ma.us/mhc/mhcform/formidx.htm

in the Board of Underwater Archaeological Resources' 2022 Policy Guidance on Archaeological Investigations and Related Survey Standards for the Discovery of Underwater Archaeological Resources. This guidance is available on the NAE Regulatory website: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

Please note, a negative result from MHC and/or BUAR does not necessarily mean no historic properties are present. Often proposed project sites have not been previously subject to a survey, so historic properties which may be present have not been previously recorded.

4. Tribal Coordination

Prospective applicants shall mail the Project Notification Form, project narrative, location (coordinates), plans with locus map, soil maps, and information on cultural resources to the Wampanoag Tribe of Gay Head (Aquinnah), Mashpee Wampanoag Tribe, Narragansett Indian Tribe, and/or Stockbridge-Munsee Community Band of Mohican Indians with interests in the project location. Preferred tribal contact information, including their respective areas of interest, can be found below. Applicants shall follow the same procedures as identified in Section 3(a)i-iii above when notifying Tribes of the proposed activity. Applicants shall provide the USACE with any responses received from the tribe(s) with their PCN application. If a tribe does not respond within 30 days of receiving the notification, the applicant shall provide USACE with all documentation of tribal outreach with their SV or PCN submission (e.g., emails, letters, phone call log, etc.). If the tribe indicates the presence of a previously unrecorded cultural resource, including a traditional cultural property (TCP) or traditional cultural landscape (TCL), a PCN is required.

5. Effect Determination

The project may have the potential to affect historic properties and/or tribal resources if 1) notification recipients respond within 30 calendar days of notification with concerns, 2) historic properties eligible for listing, or potentially eligible for listing in the NRHP, are present or 3) tribal resources are known to be present. The USACE may need to further review the project to confirm potential effects to historic properties and/or tribal resources. A PCN is required for any activity that may affect a historic property.

The USACE may determine the project will have 'no effect' on historic properties (i.e., no historic properties affected) when procedures outlined in Section 3 above are followed and no cultural resources are identified. Similarly, if historic properties are identified and will be completely avoided, the USACE may determine 'no effect.'

6. Contact Information:

Massachusetts Historical Commission

The Massachusetts Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

No email. Applicants or their representatives must send project information via certified mail and submit the certified mail receipt to the USACE or send via regular mail and submit proof of delivery.

Area of concern: All of Massachusetts.

Massachusetts Board of Underwater Archaeological Resources (BUAR)

100 Cambridge Street, Suite 900
Boston, Massachusetts 02114
Email: david.s.robinson@mass.gov

Applicants or their representatives must send project information via email (***strongly preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All waterbodies in Massachusetts.

Wampanoag Tribe of Gay Head (Aquinnah)

Bettina Washington
Tribal Historic Preservation Officer (THPO)
20 Black Brook Road
Aquinnah, Massachusetts 02535
Email: thpo@wampanoagtribe-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All of Massachusetts.

Mashpee Wampanoag Tribe

ATTN: David Weeden
Tribal Historic Preservation Officer (THPO)
483 Great Neck Road South
Mashpee, Massachusetts 02649
Email: 106review@mwtribe-nsn.gov
Cc: David.weeden@mwtribe-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All of Massachusetts.

Narragansett Indian Tribe

ATTN: John Brown
Tribal Historic Preservation Officer (THPO)
Narragansett Indian Longhouse
4425 South County Trail
Charlestown, Rhode Island 02813
Email: tashtesook@aol.com

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: Massachusetts east of the Connecticut River.

Stockbridge-Munsee Community Band of Mohican Indians

ATTN: Jeff Bendremer
Tribal Historic Preservation Manager
Stockbridge-Munsee Community
Tribal Historic Preservation Extension office
86 Spring Street
Williamstown, Massachusetts 01267
Email: thpo@mohican-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: West of the Connecticut River and Northfield, Montague, Miller's Falls, Turner's Falls, Sunderland, Amherst, Hadley, South Hadley, Chicopee, Springfield and Longmeadow.

APPENDIX B PRE-CONSTRUCTION NOTIFICATION

U.S. Army Corps of Engineers (USACE), New England District (NAE)

PRE-CONSTRUCTION NOTIFICATION (PCN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose The information provided will be used in evaluating activities under Pre-Construction Notification procedures within New England.

Routine Uses This information may be shared with other federal, state, and local government agencies during the application review process. Submission

Disclosure of requested information is voluntary. However, if information is not provided the PCN application cannot be fully evaluated nor can USACE render a permit decision.

Instructions The applicant must complete ALL required sections of this document before their submission to USACE. The PCN submission to USACE shall include one set of drawings which show the location and character of the proposed activity, statements that address each required field below, and documentation that supports each field (e.g., emails, letters, description/narrative, phone calls, surveys, reports, etc.). Electronic submissions to the following address are strongly preferred: cenae-r-ma@usace.army.mil. The email subject line shall contain the following: General Permit #, PCN, City/Town, and date submitted. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)
First - Middle - Last -	First - Middle - Last -
Company -	Company -
E-mail Address -	E-mail Address -
6. APPLICANT'S ADDRESS:	9. AGENT'S ADDRESS:
Address-	Address-
City - State - Zip - Country -	City - State - Zip - Country -
7. APPLICANT'S PHONE NOs. with AREA CODE	10. AGENT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile	a. Residence b. Business c. Fax d. Mobile

STATEMENT OF AUTHORIZATION

11. I hereby authorize, _____ to act on my behalf as my agent in the processing of this general permit PCN application and to furnish, upon request, supplemental information in support of this general permit PCN application.

_____ _____

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)	14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)
15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)	City: State: Zip:
Latitude: °N Longitude: °W	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: Municipality:

Section: Township: Range:

17. DIRECTIONS TO THE SITE.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by Proposed General Permit Activity (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration	Purpose

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site.

23. List any other GP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project on any related activity (*see instructions*)

24. If the proposed activity will result in the loss of aquatic resources that exceed those identified in the New England District Compensatory Mitigation Thresholds, explain how the compensatory mitigation requirement will be satisfied. (*see instructions*)

25. Is Any Portion of the General Permit Activity Already Complete? ☐ Yes ☐ No If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. (*see instructions*)

27. List any historic properties that have the potential to be affected by the proposed GP activity or include a vicinity map indicating the location of the historic property or properties. Attach relevant project information, along with any responses received from project notifications to this submittal. (*see instructions*)

28. For a proposed GP activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, identify the Wild and Scenic River or the "study river":

29. If the proposed GP activity also requires permission from the USACE pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, have you submitted a written request for section 408 permission from the USACE district having jurisdiction over that project? ☐ Yes ☐ No

If "yes", please provide the date your request was submitted to the USACE District:

30. Does the activity require a 401 Water Quality Certification (WQC)? If so, specify the type of 401 WQC that is required (general or individual). In cases where an individual 401 WQC is required, provide the date the 401 WQC certification request was submitted to the certifying authority and their contact information.

31. If the terms of the GP(s) you want to use require additional information to be included in the PCN (i.e. sampling and analysis plan), please include that information in this space or provide it on an additional sheet of paper marked Block 30. (*see instructions*)

32. I certify that the information in this pre-construction notification is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The Pre-Construction Notification must be signed by the person who desires to undertake the proposed activity (applicant) and, if the statement in block 11 has been filled out and signed, the authorized agent.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a

Department of the Army

General Permit (GP) Pre-Construction Notification (PCN)

Blocks 1 through 4. To be completed by the U.S. Army Corps of Engineers.

Block 5. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the PCN, please attach a sheet of paper with the necessary information marked Block 5.

Block 6. Address of Applicant. Please provide the full address of the party or parties responsible for the PCN. If more space is needed, attach an extra sheet of paper marked Block 6.

Block 7. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed, if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 9 and 10. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by the applicant, if an agent is to be employed.

Block 12. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 13. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Activity Street Address. If the proposed GP activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. Location of Proposed Activity. Enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area requiring evaluation. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 15.

Block 16. Other Location Descriptions. If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality where the site is located.

Block 17. Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide a description of the location of the proposed GP activity, such as lot numbers, tract numbers, or you may choose to locate the proposed GP activity site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed GP activity site if known. If there are multiple locations, please indicate directions to each location on a separate sheet of paper and mark as Block 17.

Block 18. Identify the Specific General Permit(s) You Propose to Use. List the number(s) of the General Permit(s) you want to use to authorize the proposed activity (e.g., GP 4).

Block 19. Description of the Proposed General Permit Activity. Describe the proposed GP activity, including the direct and indirect adverse environmental effects of the proposed activity. The description of the proposed activity should be sufficiently detailed for USACE to determine that the adverse environmental effects of the activity will be no more than minimal. Identify the materials to be used in construction, as well as the methods by which the work is to be done.

Provide drawings to show that the proposed GP activity complies with the terms of the applicable GP(s). Drawings should contain sufficient detail to provide an illustrative description of the proposed GP activity, but do not need to be detailed engineering plans. The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 19.

Block 20: Description of Proposed Mitigation Measures. Describe any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed GP activity. The description of any proposed mitigation measures should be sufficiently detailed for USACE to determine how the measures would avoid and minimize adverse environmental effects. If adverse effects exceed the New England District compensatory mitigation thresholds, you must document how compensatory mitigation would be satisfied in Block 24.

Block 21. Purpose of General Permit Activity. Describe the purpose and need for the proposed GP activity. What will it be used for and why? Also include a brief description of any related activities associated with the proposed project. Provide the approximate dates you plan to begin and complete all work.

Block 22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by the Proposed General Permit Activity. For discharges of dredged or fill material into Waters of the U.S., provide the amount of wetlands, streams, or other types of waters filled, flooded, excavated, or drained by the proposed GP activity. For structures or work in Navigable Waters of the U.S. subject to Section 10 of the Rivers and Harbors Act of 1899, provide the amount of navigable waters filled, dredged, occupied by one or more structures (e.g., aids to navigation, mooring buoys) by the proposed GP activity. The area of impact includes the structures or fills with direct or indirect effects to waters of the U.S. The length of impact includes the length of a stream, including is banks, that are directly affected by the structures or fills. The duration of impact should be identified as temporary (xx days) or permanent. The impact purpose should briefly describe what structure or fill is responsible for the impact.

Block 23. Identify Any Other General Permit(s), Regional General Permit(s), or Individual Permit(s) Used to Authorize Any Part of Proposed Activity or Any Related Activity. List any other GP(s) or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. For linear projects, list other separate and distant crossings of waters and wetlands authorized by these GPs that do not require PCNs. If more space is needed, attach an extra sheet of paper marked Block 23.

Block 24. Compensatory Mitigation Statement for Losses Greater Than the New England District Compensatory Mitigation Thresholds. New England District requires compensatory mitigation at a minimum one for one replacement ratio or greater for all aquatic resource losses that require a PCN and exceed the New England District Compensatory Mitigation Thresholds, unless USACE determines in writing that either some other form of mitigation is more environmentally appropriate or the adverse environmental effects of the proposed GP activity are no more than minimal without compensatory mitigation, and provides an activity specific waiver of this requirement. Describe the proposed compensatory mitigation for wetland losses greater than the New England District Compensatory Mitigation Thresholds or provide an explanation of why USACE should not require wetland compensatory mitigation for the proposed GP activity. If more space is needed, attach an extra sheet of paper marked Block 24.

Block 25. Is Any Portion of the General Permit Activity Already Complete? Describe any work that has already been completed for the GP activity.

Block 26. List the Name(s) of Any Species Listed As Endangered or Threatened under the Endangered Species Act that Might be Affected by the General Permit Activity. If you are not a federal agency, and if any listed species or designated critical habitat might be affected or is in the vicinity of the proposed GP activity, or if the proposed GP activity is located in designated critical habitat, list the name(s) of those endangered or threatened species that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 7 of the Endangered Species Act.

Block 27. List Any Historic Properties that Have the Potential to be Affected by the General Permit Activity. If you are not a federal agency, and if any historic properties have the potential to be affected by the proposed GP activity, list the name(s) of those historic properties that have the potential to be affected by the proposed GP activity. Provide all relevant documentation about these historic properties in the PCN submittal. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

Block 28. List the Wild and Scenic River or Congressionally Designated Study River if the General Permit Activity Would Occur in such a River. If the proposed GP activity will occur in a river in the National Wild and Scenic River System or in a river officially designated by Congress as a “study river” under the Wild and Scenic Rivers Act, provide the name of the river. For a list of Wild and Scenic Rivers and study rivers, please visit http://www.rivers.gov/

Block 29. General Permit Activities that also Require Permission from the USACE Under 33 U.S.C. 408. If the proposed GP activity also requires permission from the USACE under 33 U.S.C. 408 because it will temporarily or permanently alter, occupy, or use a USACE federal authorized civil works project, indicate whether you have submitted a written request for section 408 permission from the USACE district having jurisdiction over that project.

Block 30. 401 Water Quality Certification. As described above, specify if the activity requires a 401 WQC from the certifying authority.

Block 31. Other Information Required For General Permit Pre Construction Notifications. The terms of some of the General Permits include additional information requirements for preconstruction notifications:

* Maintenance – information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals.
* Temporary Construction, Access, and Dewatering – a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions.
* Repair of Uplands Damaged by Discrete Events – documentation, such as a recent topographic survey or photographs, to justify the extent of the proposed restoration.
* Commercial Shellfish Aquaculture Activities – (1) a map showing the boundaries of the project area, with latitude and longitude coordinates for each corner of the project area; (2) the name(s) of the species that will be cultivated during the period this GP is in effect; (3) whether canopy predator nets will be used; (4) whether suspended cultivation techniques will be used; and (5) general water depths in the project area (a detailed survey is not required).Dredging – (1) a proposed sampling and analysis plan shall be provided to USACE for approval prior to its execution. Pre-application meetings are encouraged.
* Beach Nourishment – sediment grain size should be determined for the length of the beach where nourishment is proposed. The frequency and locations of sediment sampling shall be sufficient to identify the sediment composition of the beach profile. This data shall be consolidated to generate a sediment gradation curve for each sampled transect. Each sampled transect should also be identified on the project plans (drawings).

If more space is needed, attach an extra sheet of paper marked Box 31.

Block 32. Signature of Applicant or Agent. The PCN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the PCN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the PCN possesses the requisite property rights to undertake the GP activity (including compliance with special conditions, mitigation, etc.).

DELINEATION OF WETLANDS, OTHER SPECIAL AQUATIC SITES, AND OTHER WATERS

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by the USACE. The permittee may ask the USACE to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the USACE does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. The 60-day PCN review period will not start until a delineation has been completed.

DRAWINGS AND ILLUSTRATIONS

General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross Section Map. Identify each illustration with a figure or attachment number. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings should also be included. Please submit one copy of all drawings on 8½ x 11 inch plain white paper (electronic submissions preferred). Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.

ADDITIONAL INFORMATION AND REQUIREMENTS

For proposed GP activities that involve discharges into waters of the United States, water quality certification from the State, Tribe, or EPA must be obtained or waived. Some States, Tribes, or EPA have issued water quality certification for one or more GPs. Please check the New England District website to see if water quality certification has already been issued for the GP(s) you wish to use. For proposed GP activities in coastal states, state Coastal Zone Management Act consistency concurrence must be obtained, or a presumption of concurrence must occur. Some States have issued Coastal Zone Management Act consistency concurrences for one or more GPs. Please check the New England District website to see if Coastal Zone Management Act consistency concurrence has already been issued for the GP(s) you wish to use.

APPENDIX C SELF-VERIFICATION NOTIFICATION

U.S. Army Corps of Engineers (USACE)

SELF-VERIFICATION NOTIFICATION (SVN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose This information will be used in evaluating activities under Self-Verification procedures within Massachusetts.

Routine Uses Routine uses will include: (1) Documenting compliance with the terms and conditions of the General Permit (GP) for activities that may require authorization pursuant to one or more of USACE's Regulatory authorities. (2) Records may be referred to other Federal, State, and local agencies for evaluation and enforcement purposes.

Disclosure Failure to fully comply and abide by the GP terms and conditions prior to commencing work and after completion project may result in formal enforcement action, up to and including monetary penalties and/or legal action, pursuant to 33 CFR Part 326.

Instructions The permittee must complete ALL required sections of this document before commencing USACE-regulated activities. A copy of this completed SVN must be kept on site during construction and be made available for review by USACE and other Federal, State, & Local regulatory authorities at any time. Within 30 days of initiating project construction, the permittee shall submit the completed SVN to USACE. The SVN shall be submitted to USACE as **ONE signed document** that includes project plans and documentation that supports each field (e.g., emails, letters, description, phone calls, surveys). Electronic submissions to the following address are strongly preferred: cenae-r-ma-sv@usace.army.mil. The email subject line shall contain the following: GP #, SVN, City/Town, and date submitted.

(ITEMS 1 THRU 3 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED

APPLICANT AND AGENT INFORMATION

4. APPLICANT'S NAME	7. AGENT'S ADDRESS:
First - Middle - Last -	First - Middle - Last -
Company -	Company -
E-mail Address -	E-mail Address -
5. APPLICANT'S ADDRESS:	8. AGENT'S ADDRESS:
Address-	Address-
City - State - Zip - Country -	City - State - Zip - Country -
6. APPLICANT'S PHONE NOs. w/AREA CODE	9. AGENTS PHONE NOs. w/AREA CODE
a. Residence b. Business c. Fax	a. Residence b. Business c. Fax

NAME, LOCATION, AND DESCRIPTION OF PROJECT SITE

10. PROJECT NAME OR TITLE

11. FILE NUMBER(S) OF PREVIOUS USACE ACTIONS ON THE SITE (if applicable)	12. NAME OF WATERBODY
13. PROJECT COORDINATES (in decimal degrees)	14. PROJECT STREET ADDRESS (if applicable)
Latitude: ◦N Longitude: ◦W	Address
	City - State - Zip -

ACTIVITY TYPE, PROJECT IMPACTS, AVOIDANCE & MINIMIZATION

15. GENERAL PERMIT ACTIVITIES (CHECK ALL THAT APPLY)

1 ☐	6 ☐	11 ☐	16 ☐	21 ☐
2 ☐	7 ☐	12 ☐	17 ☐	22 ☐
3 ☐	8 ☐	13 ☐	18 ☐	23 ☐
4 ☐	9 ☐	14 ☐	19 ☐	24 ☐
5 ☐	10 ☐	15 ☐	20 ☐	25 ☐

16. SUMMARY OF PROJECT IMPACTS (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration

17. PROJECT PLANS (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE ITEMS ARE COMPLETE) (*see instructions*)

- ☐ a. Plans shall at least contain the following: Vicinity Map, Plan View, and Typical Cross Section View of the proposed activity.
- ☐ b. All direct, indirect and secondary impacts from USACE regulated activities are shown on the project plans.
- ☐ c. The size of the impact area for each activity (acre, square feet, linear feet) are shown on the project plans.
- ☐ d. For discharges of fill material (§404), the volume of fill material is identified on the project plans.
- ☐ e. The duration of each impact, permanent or temporary (X days), is identified on the project plans.
- ☐ f. Do activities with permanent impacts result in the loss of waters? If so, this is identified on the project plans.
- ☐ g. All aquatic resources in the vicinity of the USACE regulated activities are delineated on the project plans.

18. AVOIDANCE & MINIMIZATION (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE CRITERIA ARE MET) (*see instructions*)

- ☐ a. The project has been designed to avoid and minimize impacts to aquatic resources.
- ☐ b. The footprint of activities in waters of the U.S. has been reduced to only what is necessary to achieve the overall project purpose.
- ☐ c. All practicable measures have been taken to avoid and minimize impacts to aquatic resources through construction techniques and site access (e.g., Best Management Practices, Time of Year Restrictions).
- ☐ d. All temporary impacts from USACE regulated activities will be restored upon completion of construction and the project area will be returned to pre-construction contours and conditions.

COMPLIANCE WITH FEDERAL REGULATIONS & SUPPLEMENTAL INFORMATION

19. DUE DILIGENCE (*see instructions*)

Complete the entries below to document compliance with the following Federal requirements. Construction may NOT begin if a PCN is/may be required, and you must contact USACE to determine permitting requirements. Documentation that demonstrates how the activity complies with each field below shall be submitted to the USACE as noted in the instructions block. See each General Condition (GC) in the GP for how to comply with each requirement.

a. State Historic Preservation Officer	Select Option
b. Massachusetts BUAR	Select Option
c. Tribal Historic Preservation Officers	Select Option
d. Endangered Species Act - NOAA	Select Option
e. Endangered Species Act - USFWS	Select Option
f. Northern Long Eared Bat (ESA)	Select Option
g. Essential Fish Habitat	Select Option
h. Wild & Scenic Rivers	Select Option
i. 401 Water Quality Certification 401	Select Option
	401 WQC/OOC File Number: OOC issued: 401 issued:
j. Section 408 Permission	Select Option
k. Coastal Zone	Select Option
l. Construction Mats	Select Option
m.Time of Year Restrictions	Select Option
n. Vernal Pools	Select Option
o. Sediment & Erosion Controls	Select Option
p. Stream/Wetland Crossings	Select Option

20. AQUACULTURE ACTIVITIES - GP 18 (*see instructions*)

- ☐ a. If required, an Aquaculture Certification from the Massachusetts Division of Marine Fisheries was obtained prior to commencing work.
- ☐ b. Coordination with the U.S. Coast Guard pursuant to Private Aids to Navigation has occurred prior to commencing work.
- ☐ c. If required, a MEPA Certificate was obtained from the Massachusetts Environmental Protection Agency prior to commencing work. Select Option
- ☐ d. The prospective permittee contacted local authorities (e.g. harbormaster, select board, shellfish constable) for authorization of their facility prior to commencing work.

21. ADDITIONAL INFORMATION/ATTACHMENTS (*see instructions*)

- ☐ a. The project plans are enclosed in this SVN submittal (see block 17).
- ☐ b. The activity Select Option funded through the Bipartisan Infrastructure Bill (also known as the Infrastructure Investment and Jobs Act).
- ☐ c. All required state, local and federal approvals were acquired prior to starting construction in USACE jurisdiction.
- ☐ d. After construction of the activity is completed, a complete Certificate of Compliance will be submitted to USACE.

22. IS THERE ANOTHER LEAD FEDERAL AGENCY:

☐ YES ☐ NO

23. STATEMENT OF AUTHORIZATION *(see instructions)*

I certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

24. SIGNATURES *(see instructions)*

I hereby certify that the information in this Self-Verification Notification is complete and accurate. As the applicant or their duly authorized agent, I certify the activity was completed in accordance with the terms and conditions of the GP. This includes all applicable terms, general conditions, and activity-specific GP criteria. I agree to allow the duly authorized representatives of the Corps of Engineers Regulatory Program and other regulatory or advisory agencies to enter upon the premises of the project site at reasonable times to evaluate inspect and photograph site conditions. This consent to enter the property is superior to, takes precedence over, and waives any communication to the contrary. For example, if the property is posted as “no trespassing” this consent specifically supersedes and waives that prohibition and grants permission to enter the property despite such posting.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a
Department of the Army
General Permit (GP) Self-Verification

Blocks 1 through 3. To be completed by the Corps of Engineers.

Block 4. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the self-verification, please attach a sheet of paper with the necessary information marked Block 4.

Block 5. Address of Applicant. Please provide the full address of the party or parties responsible for the self-verification. If more space is needed, attach an extra sheet of paper marked Block 5.

Block 6. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 7 through 9. To be completed, if you choose to have an agent.

Block 7. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 8 and 9. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 10. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 11. File Number(s) of Previous USACE Actions on the Site Please provide any known USACE file number. If the activity does not have a known USACE file number, you may state N/A.

Block 12. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 13. Proposed Activity Coordinates. Please enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 13.

Block 14. Proposed Activity Street Address. If the proposed activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. General Permit Activity Type. Please select all GP activity types that apply to the proposed activity. A list of GP activity types can be found in Section III of the GP.

Block 16. Summary of Project Impacts. Please provide ALL proposed impacts, both temporary and permanent in duration, that are located in Waters of the United States. The area of impact shall be provided in square feet (SF). When applicable, impacts that result in conversion of stream bank or shoreline must also be identified in linear feet (LF). Dredging or the discharge of dredged or fill material shall also include the volume, cubic yards (CY), of material removed from or placed into Waters of the U.S. If more entries are required, please attach a table matching the desired format in Block 16.

Block 17. Project Plans. Please verify that items a-g are included in the project plans. Three types of illustrations are necessary to properly depict the proposed work. These illustrations or drawings are identified as a Vicinity Map, a Plan View (Aerial view) and a Cross Section Map. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings (longitudinal profile) should also be included. Plans must accurately depict the existing conditions and all aspects of the proposed activity located in waters of the U.S. Please submit one copy of all drawings formatted to print on 8½ x 11 inch or 11 x 17 inch plain white paper. Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be certified engineering sheets; they should be clear, accurate, contain all necessary information, and depict all proposed work. Each submission must also include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by USACE.

Block 18. Avoidance & Minimization. Please verify that items a-d have been implemented for the proposed activity.

Block 19. Due Diligence. Please complete all the fields and submit documentation to USACE to demonstrate compliance with the above requirements. This Documentation may include emails, letters, meeting notes, phone call log, project narrative, project plans, a species list from the NOAA Section 7 Mapper, a completed copy of the IPAC determination keys, etc. Documentation should be limited to what is necessary to demonstrate how the proposed activity meets each requirement. Refer to the MA GP, Appendix A, for specific guidance on the identification of previously identified historic properties and previously unidentified historic properties. Endangered Species: *The applicant must be designated as the non-federal representative for the purposes of Section 7 consultation to select the Rangewide D-Key options. Otherwise, the applicant shall select the following option when IPAC indicates the NLEB is present: "The activity IS located within the NLEB Species Range (PCN Required)."

Block 20. Aquaculture Activities. Please verify that items a-d have been obtained or completed prior to commencing work in waters of the U.S.

Block 21. Additional Information/Attachments. Please verify that items a-d have been completed prior to commencing work in waters of the U.S.

Block 22. Lead Federal Agency. Please identify if there is another lead federal agency involved with the proposed activity. Enter the lead federal agency name (e.g., the Federal Emergency Management Agency, FEMA) and the agency's designated person of contact for the activity.

Block 23. Statement of Authorization. The applicant shall sign this section for all activities. If an agent is to be employed, the agent shall sign this section.

Block 24. Signatures. The SVN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the SVN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the SVN possesses the requisite property rights to undertake the GP activity.

US Army Corps of Engineers®
New England District

APPENDIX D: PCN APPLICATION CHECKLIST

The following information shall be submitted for all PCNs for USACE to properly evaluate your application. Some applications may require more information and this checklist is offered as a tool to assist applicants with submitting a complete application.

SECTION 1: GENERAL APPLICATION INFORMATION

1. ☐ Complete the Pre-Construction Notification document (Appendix B).
2. ☐ Specify which local/state/federal authorizations are required for the project and if any have been obtained or applied for at the time of USACE application submittal.
3. ☐ Identify all funding sources the project will receive or has received to date. Provide any relevant information in the application submission.
4. ☐ Is this part of a larger project that is being implemented in phases? If so, describe the project schedule and how each phase will be implemented.
5. ☐ Describe the existing conditions on the site and the general land use in the vicinity of the project at the time application submittal.
6. ☐ Provide any historic information available that you may have of project area, e.g., existing USACE permit numbers, the names under which the permits were obtained if the permit numbers are unknown, construction dates and proof of prior existence (aerials, photos, town hall records, affidavits, state or local permits, etc.) to verify that the project predates regulation and is "vested".[19]
7. ☐ The anticipated start and end dates for construction.

SECTION 2: WETLAND DELINEATION

8. ☐ Data used to support aquatic resource boundary determinations (delineation forms, delineation map(s) that show the locations of each aquatic resource in the project area, aerial and ground photographs, LIDAR imagery, national wetland inventory maps, soil maps, national hydrography dataset maps, floodplain maps, historical imagery, etc.).
9. ☐ Photographs of the wetland(s) and/or waterway(s) where impacts are proposed. Photos at low tide are preferred for work in tidal waters.
10. ☐ Indicate the relationship of the project area to waters of the U.S., i.e., adjacent wetlands, tidal influence or hydraulic connectivity through culverts, or other conveyances, etc.
11. ☐ At minimum the delineation map/figure should include the following:
    a. Contour lines showing topography.
    b. North arrow.
    c. Bar and text scale.
    d. Legend.
    e. Drawn project boundary.
    f. High tide line, mean high water, mean low water, ordinary high water mark, and/or wetland boundaries.
    g. Captions with a unique name for each aquatic resource and the area or length of the aquatic resource within the project area.

[19] Vested is exempt (someone or something) from a new law or regulation.

h. Appropriate landmarks and features (e.g., culverts, special aquatic sites, etc.).
i. Points showing the paired upland and wetland delineation locations for tidal and non-tidal wetlands only.

SECTION 3: AVOIDANCE & MINIMIZATION

12. ☐ Describe specific measures taken to avoid impacts to aquatic resources or describe why aquatic resources could not be avoided while achieving the project purpose and need.
13. ☐ For impacts to aquatic resources that could not be avoided, describe specific considerations/ measures taken to minimize the area of proposed impacts to aquatic resources in designing the project.
14. ☐ Describe specific measures taken to avoid and minimize the proposed direct, indirect, and secondary impacts to aquatic resources and their functions through construction techniques and timing.
15. ☐ If applicable, provide a restoration plan that describes how all temporary fills and structures will be removed and the area restored to pre-impact conditions (see GC 22).
16. ☐ If applicable, provide an Invasive Species Control Plan (see GC 29). For sample control plans, see www.nae.usace.army.mil/missions/regulatory/invasive-species.
17. ☐ If applicable, describe how the proposed wetland/waterbody crossing is compliant with GC 31, Stream Work and Crossings, and Wetland Crossings.

SECTION 4A: PROJECT IMPACTS

18. ☐ Describe the overall project and the activities located in Waters of the U.S. (WOTUS) that you are seeking authorization for.
19. ☐ Identify the following for project impacts in WOTUS:
    a. ☐ Direct, indirect, secondary impacts[20] within WOTUS.
    b. ☐ The size of each impact (square feet or acres, or linear feet).
    c. ☐ For discharges of fill material (§404), specify the volume of fill material to be discharged (cubic yards).
    d. ☐ The impact duration from each activity, permanent or temporary (X days).

SECTION 4B: PROJECT PLANS

20. ☐ Submit project plans that depict all impacts in WOTUS. On the project plans, applicants shall provide:

    General Information

    a. ☐ Plan view and typical cross-section view sheets that show the existing and proposed conditions. These illustrations should each be identified with a figure number, date of the map, the project title, the name of the applicant and the type of illustration (vicinity map, plan view, or cross section).
    b. ☐ Drawings, sketches, or plans that are legible, reproducible (color is encouraged, but features must be distinguishable in black and white), drawn to scale, and no larger than 11”x17” and 10 MB when submitted in digital format. Numeric and graphic/bar scales must agree, and plan details must be measurable using a standard engineer’s scale on printed plans. Reduced plans are not acceptable.
    c. ☐ The north arrow and remove miscellaneous non-wetland or water project related features such as conduits, utility poles, guardrails, etc.

[20] See definitions section for the definitions of direct, indirect, secondary impacts.

d. ☐ Clearly draw the overall limits of work, staging areas, disposal sites, access routes, and any permittee responsible mitigation sites. These areas may include both aquatic resources and upland areas.
e. ☐ Names or numbers of all roads in the site's vicinity and ownership and numbers of abutting parcels.
f. ☐ Datum in plan and elevation views. The horizontal datum shall be in the NAD 83 Massachusetts State Plane Coordinate System (INSERT) in U.S. survey feet. The vertical data in coastal projects shall be referenced to either MLLW or the North American Vertical Datum of 1988 (NAVD 88). Both the distance and depth units shall be U.S. survey feet and specified on the project plans.

Aquatic Resources & Project Impacts

g. ☐ Delineation of all aquatic resource types on site including salt marsh; other special aquatic sites (vegetated shallows, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges); other waters, such as lakes, ponds, vernal pools, natural rocky habitat (tidal only), and perennial, intermittent, and ephemeral streams.
h. ☐ Identify the substrate type (cobble/gravel, organic detritus, sand/shell, silt, mud) and the approximate percentage of each substrate type on site. Grain sizes shall be based on Wentworth grain size classification scale for granules, pebbles, cobbles, and boulders. Sediment samples with a content of 10% or more of pebble-gravel-cobble and/or boulder in the top layer (6-12 inches) should be delineated and material with epifauna/macroalgae should be differentiated from bare pebble-gravel-cobble and boulder.
i. ☐ The direction of ebb and flood in tidal waters and direction of flow in non-tidal waters.
j. ☐ In tidal waters, the project boundary distance from special aquatic sites identified in 20g above if within 25 feet from that resource.
k. ☐ USACE jurisdictional boundaries including ordinary high-water mark (OHWM), high tide line (HTL), mean high water (MHW). Other boundaries include mean low water (MLW), mean lower low water (MLLW), as applicable.
   - Non-tidal: OHWM and/or wetland boundaries.
   - Tidal (structures/work only): MHW, MLW.
   - Tidal (Fill and Structures/work): HTL, MHW, MLW.
   - Tidal (Dredging/Beach Nourishment): HTL, MHW, MLW, MLLW.
l. ☐ Identification of each aquatic resource with a unique name (ex. Wetland 1, Wetland 2, Tributary 1, Beaver Brook, Atlantic Ocean) and the size of each aquatic resource within the project area (square feet or acres).
m. ☐ Impacts to each aquatic resource with captions denoting the size of each impact (square feet, acres, or linear feet) and the duration of the impact (ex. Permanent, Temporary (X days).

SECTION 4C: PROJECT PLANS - SPECIFIC PROJECT INFORMATION

21. ☐ For projects involving Navigation, Structures, Dredging, and/or Beach Nourishment, the applicant shall also address the following:

Navigation

a. ☐ Identify the locations of adjacent Federal navigation project (FNP) and/or state/local navigation projects on the project plans.
b. ☐ Specify the distance between the FNP and proposed project boundary, the authorized depths of the FNP, and state plane coordinates of seaward end(s) of project structures near an FNP.

Structures

a. ☐ Identification of the piling type (steel, timber, concrete) and diameter to be removed and/or installed.
b. ☐ Specify the minimal height of the structures' frame over saltmarsh. To meet the SV threshold, piers must be ≤4 feet in width and this minimal height must achieve a 1.5:1 ratio (i.e., a 4-foot-wide pier is 6 feet above a saltmarsh).
c. ☐ For floats, the methods of securing them (piles, bottom anchors) and for keeping them off substrate (skids, stops) at low water. To meet the SV threshold, a minimum depth of 18-inches of water should be maintained below a floating dock/structure at lower tide levels.

Dredging

a. ☐ The area (SF, acre) and volume (CY) of material to be dredged waterward of MHW for each dredge location.
b. ☐ Dredge boundaries.
c. ☐ Bathymetry for existing, proposed, and historical (include dates and USACE permits) dredge depths.
d. ☐ The likely final angle of repose of the side cuts based on the physical characterization of the material to be dredged and based upon the high/ medium/low, wave or current energy of the location.
e. ☐ Label area whether the dredging is new, maintenance, improvement, or a combination.
f. ☐ Location of the disposal site (include location sheet). NOTE: For projects proposing open water, nearshore disposal, or beach nourishment, contact USACE as early as possible for sampling and testing protocols. Sediment testing, including physical (e.g., grain-size analysis), chemical and biological testing may be required. Sampling/testing of sediments without such contact should not occur and if done, will be at the applicant's risk.
g. ☐ The methods and areas used to retain or prevent dredged material from running back into the wetland or waterway. Provide the capacity of the storage area and points of runback, including the overflow route, into the aquatic system.
h. ☐ For open-water disposal, explain why inland or beneficial reuse sites are not practicable.
i. ☐ Show the finished top elevation of the disposal site.

Beach Nourishment

a. ☐ For beach nourishment, identify the disposal footprint, existing and proposed nourishment profiles (multiple profiles are appropriate if the site is more than 150 feet long or non-contiguous), total fill area (SF) and volume (CY), fill area and volume waterward of the HTL, and delineation of dunes, banks, existing beach vegetation, and contours.
b. ☐ For beach nourishment identify the substrate type (fine sand, sand, cobble, boulder) and/or grain-size of existing material.

SECTION 5: STRUCTURES

22. ☐ For projects with the removal of existing pilings identify the number, type (steel, timber, concrete) and diameter of pilings to be removed and the methodology for removal (cut off at mud line, pulling, vibratory, etc.).
23. ☐ For projects with the installation of new pilings identify the number, type (steel, timber, concrete) and diameter of pilings to be installed and the methodology for installation (vibratory hammer, impact hammer etc.).
24. ☐ Identify any existing structures and moorings in waters adjacent to the proposed activity, their dimensions, and the distance to the limits and coordinates of any proposed mooring field or reconfiguration zone. For reconfiguration zone and mooring fields, provide the coordinates for all

corners based on the Massachusetts State Plane Coordinate System. Specify the maximum number of slips and/or moorings within proposed reconfiguration zones or anchorage areas.

25. ☐ The dimensions of the structure or work and extent of encroachment waterward of MHW and from affixed point on the shoreline or upland.
26. ☐ Shoreline of adjacent properties and property boundary offset for structures. In narrow waterbodies, the distance to opposite shoreline, waterway width, and structures across from proposed work.
27. ☐ For new commercial boating facilities, anchorage areas or reconfiguration zones, provide a description of the type of vessels that would use the facility, and any plans for sewage pump-out facilities, fueling facilities and contingency plans for oil spills.
28. ☐ See Sections 4A-C above.

SECTION 6: AQUACULTURE

29. ☐ Identify the coordinates for lease area corners and gear configuration area on the project plans.
30. ☐ Identify the proposed aquaculture gear type (buoys, floats, racks, trays, nets, lines, tubes, cages, containers, and other structures). Provide the impacts for each aquaculture gear type (see Section 4A 19a-d).
31. ☐ For a GP 18 to be valid, applicants must have (a) their MA DMF Aquaculture Certification letter for licensed shellfish aquaculture sites, (b) documentation that the applicant has coordinated with the U.S. Coast Guard regarding USCG Private Aids to Navigation standards, (c) their MEPA Certificate (if required), and (d) documentation that the applicant has contacted their local authorities (ex. harbormaster, select board, shellfish constable) for authorization of their facility.
32. Provide information on site the operation, maintenance, and access. Will the site be accessed via boat, kayak, etc.? Will cages be removed in the winter? How often will gear be checked on? Is there an operations plan for the proposed aquaculture area?
33. ☐ See Sections 4A-C above.

SECTION 7: DREDGING

34. ☐ Sampling plan requests for new, improvement or maintenance dredging must submit completed **Dredged Material Evaluation checklist found at Dredged Material Evaluation Checklist, Sampling and Analysis Plan Requirements from Applicant (army.mil)** and identify the method of handling/transporting the dredged material.
35. ☐ Identify grain-size of material to be dredged (e.g., silty sand) and provide any existing sediment grain size and bulk sediment chemistry data from the proposed project or nearby projects. Include information on any recent spills of oil and/or other hazardous materials and/or nearby outfalls. Document the information source, e.g., EPA database, the harbormaster or fire chief. If there are none, state “none”.
36. ☐ See Section 4A, 4B and 4C, Dredging 21(a-i) above.

SECTION 8: WETLAND/WATERBODY CROSSINGS

37. ☐ For the stream crossing, identify the crossing methodology on the project plan (e.g., dam and pump, dry, wet, etc.). Submit a waterway crossing sequencing plan with the application.
38. ☐ If the project includes a permanent crossing of a tidal waterway, your project design should be modified to match the velocity, depth, cross-sectional area, and substrate of the existing waterbody adjacent to the crossing and provide documentation (hydraulic analysis including low lying property analysis) that the size of the crossing will not restrict tidal flow over the full natural tide range and will not adversely affect abutting infrastructure.

39. ☐ If the work includes a permanent crossing of a non-tidal stream, your project design should be modified to match the culvert gradient of the existing stream channel profile, provide clearance for ≥1.2 times bank full width and conveyance should be embedded ≥1-2 feet for box culverts and pipe arches or ≥1-2 feet and at least 25 percent for rounded pipes/culverts in accordance with the Massachusetts Stream Crossing Standards. Provide the basis for any variation to this requirement.
40. ☐ If the work includes a permanent crossing of a non-tidal stream, the structure should be designed to include a natural bottom substrate within the conveyance that matches the characteristics of the substrate in the natural stream channel and the character of the banks (mobility, slope, stability, confinement, grain and rock size). The conveyance should be designed with a minimum openness ratio ≥0.82-feet (0.25-meters). For how to calculate openness ratio and stream simulation ecological approach for road and stream crossings, see https://www.nae.usace.army.mil/Missions/Regulatory/Stream-and-River-Continuity/.

SECTION 9: COMPENSATORY MITIGATION

41. ☐ Does the project require Compensatory Mitigation[21] for impacts to Waters of the U.S.? (See Section V in the 2023 Massachusetts General Permit)
42. ☐ If the project requires mitigation, does the selected compensatory mitigation option (i.e., In-Lieu Fee, permittee-responsible mitigation) deviate from the order of the options presented in §332.3(b)(2)-(6)? If so, please explain why. https://www.ecfr.gov/current/title-33/chapter-II/part-332/section-332.3
43. ☐ For any compensatory mitigation that involves preservation, the applicant must use a site protection instrument to preserve the parcel in perpetuity. (Conservation Easement, Deed Restriction, etc.) https://www.mass.gov/service-details/conservation-restriction-review-program.

SECTION 10: HISTORIC PROPERTIES & NOTIFICATIONS TO SHPO, THPOs, BUAR

44. ☐ Notify the SHPO, Massachusetts Historical Commission, of the Project via Certified Mail and include proof of delivery or receipt in the application package (See Appendix A).
45. ☐ As applicable, notify the THPOs, Narragansett Indian Tribe, Wampanoag Tribe of Gay Head (Aquinnah), and Mashpee Wampanoag Tribe, of the Project via email OR mail and include proof of delivery or receipt in the application package (See Appendix A).
46. ☐ As applicable, notify the BUAR via email (*strongly preferred*) OR mail and include proof of delivery or receipt in the application package (See Appendix A).
47. ☐ Include responses to this notification in the permit application.
48. ☐ As applicable, information on historic properties (Tribal and Archaeological) within the project area should be provided in the permit application.

SECTION 11: ENDANGERED SPECIES & ESSENTIAL FISH HABITAT

49. ☐ Provide a USFWS Information for Planning and Consultation (IPaC) Official Species List from https://ecos.fws.gov/ipac and the email of the individual who generated the list (see GC 10 of the 2023 Massachusetts General Permit for more information).
50. ☐ Provide a species list from the NMFS Section 7 Endangered Species Act mapper at https://noaa.maps.arcgis.com/apps/webappviewer/index.html.
51. ☐ Provide a species list from the NMFS Essential Fish Habitat Mapper at https://www.habitat.noaa.gov/apps/efhmapper/?page=page_3.

[21] Your mitigation proposal must be consistent with the December 29, 2020 Compensatory Mitigation Standard Operating Procedures at https://www.nae.usace.army.mil/Portals/74/docs/regulatory/Mitigation/Compensatory-Mitigation-SOP-2020.pdf and 2008 Mitigation Rule.

52. ☐ If the project will generate turbidity, describe the extent of turbidity and if erosion controls will be used to contain turbidity. If turbidity controls are not operationally feasible, explain the basis for your conclusion and identify any other measures that you will implement to minimize resuspension of sediment.
53. ☐ Identify the substrate type and any aquatic resources that will be affected by the proposed action. (SAV, salt marsh, sand, silt/clay, rocky/hard bottom)
54. ☐ For projects which will include the installation of pilings/sheet-piles, identify the substrate at the project site (sand, cobble, silt/mud/clay), the installation method (vibratory hammer, impact hammer, combination) and indicate whether the following “soft start” procedures at beginning of the workday and after a 30-minute period of rest will be deployed:
    a. ☐ Vibratory Pile Installation: pile driving will be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.
    b. ☐ Impact Pile Installation: pile driving will commence with an initial set of three strikes by the hammer at 40% energy, followed by a one-minute wait period, then two subsequent 3-strike sets at 40% energy, with one-minute waiting periods, before initiating continuous impact driving.
55. ☐ If the project involves dredging, describe any dredge history, number of dredge events to be covered by the permit, erosion/sediment controls, dredge type, intake structures (mesh screen size), dredged material disposal site.
56. ☐ For project activities associated with structures, identify the number, type (drill barge, work boat, tugboat, etc.), and size of any temporary vessels that will be used. Specify measures that will be implemented to ensure vessels are not berthed in shallow water or will “ground out” at low tide.
57. ☐ For aquaculture projects identify whether any component of the gear is seasonal (will be removed annually) or will be in place year-round. If gear will be present year-round and will be variably managed (e.g., floating in summer, bottom in winter) identify month/date for such configurations.
58. ☐ For aquaculture projects identify whether the project will involve use of an existing vessel or new vessel. Identify the length for all work vessels and identify the distance round trip from vessel berthing location and aquaculture area.
59. ☐ For project activities associated with docking structures (either commercial, industrial, or recreational) identify the number, type (motorized/non-motorized, jet-ski, sailboat, kayak, canoe, other that will be berthed there and the sizes of each.
60. ☐ Information required for Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act:
    a. Results of an eelgrass survey completed per the INSERT.
    b. Essential Fish Habitat Assessment to determine project-related impacts to essential fish habitat, using guidance developed by the National Marine Fisheries Service.
61. ☐ A document containing the following information (requirements of 50 CFR §600.920(e)(3)):
    a. Description of proposed action.
    b. Analysis of potential adverse effects on essential fish habitat.
    c. Conclusions regarding the effects of the action on essential fish habitat.
    d. If applicable, proposed mitigation.
    e. Analysis of alternatives to the proposed action.
    f. Other:

DOCUMENT A00844

U.S. FISH AND WILDLIFE SERVICE

NLAA CONCURRENCE VERIFICATION LETTER

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: November 04, 2022
Project code: 2022-0071703
Project Name: 608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16

Subject: Concurrence verification letter for the '608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16' project under the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated November 04, 2022 to verify that the **608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16** (Proposed Action) may rely on the concurrence provided in the February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action is within the scope and adheres to the criteria of the PBO, including the adoption of applicable avoidance and minimization measures, and may affect, but is not likely to adversely affect (NLAA) the endangered Indiana bat (*Myotis sodalis*) and/or the threatened Northern long-eared bat (*Myotis septentrionalis*). Consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) is required.

The Service has 14 calendar days to notify the lead Federal action agency or designated non-federal representative if we determine that the Proposed Action does not meet the criteria for a NLAA determination under the PBO. If we do not notify the lead Federal action agency or designated non-federal representative within that timeframe, you may proceed with the Proposed Action under the terms of the NLAA concurrence provided in the PBO. This verification period allows Service Field Offices to apply local knowledge to implementation of the PBO, as we may identify a small subset of actions having impacts that were unanticipated. In such instances,

Service Field Offices may request additional information that is necessary to verify inclusion of the proposed action under the PBO.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities: If your initial bridge/culvert or structure assessments failed to detect Indiana bats, but you later detect bats prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office. In these instances, potential incidental take of Indiana bats may be exempted provided that the take is reported to the Service.

If the Proposed Action is modified, or new information reveals that it may affect the Indiana bat and/or Northern long-eared bat in a manner or to an extent not considered in the PBO, further review to conclude the requirements of ESA Section 7(a)(2) may be required. If the Proposed Action may affect any other federally-listed or proposed species, and/or any designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please contact this Service Office.

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Candidate

Project Description

The following project name and description was collected in IPaC as part of the endangered species review process.

Name

608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16

Description

608491- MENDON- RESURFACING AND RELATED WORK ON ROUTE 16
Project limits extend from Taft Avenue in Mendon to the Mendon/Hopedale Town Line, a distance of 1.9 miles. The project involves roadway resurfacing with minor box widening as well as bike and pedestrian improvements. Intersection improvements include two new signals at Hartford Avenue West and Maple Street, and a signal upgrade at North Avenue.
Monarch Butterfly: Candidate Species only, no conservation measures at this time.

Determination Key Result

Based on your answers provided, this project(s) may affect, but is not likely to adversely affect the endangered Indiana bat and/or the threatened Northern long-eared bat, therefore, consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required. However, also based on your answers provided, this project may rely on the concurrence provided in the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

Qualification Interview

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the Northern long-eared bat[1]?

   [1] See Northern long-eared bat species profile

   Automatically answered
   Yes

3. Which Federal Agency is the lead for the action?

   A) Federal Highway Administration (FHWA)

4. Are *all* project activities limited to non-construction[1] activities only? (examples of non-construction activities include: bridge/abandoned structure assessments, surveys, planning and technical studies, property inspections, and property sales)

   [1] Construction refers to activities involving ground disturbance, percussive noise, and/or lighting.

   No

5. Does the project include *any* activities that are **greater than** 300 feet from existing road/ rail surfaces[1]?

   [1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

   No

6. Does the project include *any* activities **within** 0.5 miles of a known Indiana bat and/or NLEB hibernaculum[1]?

   [1] For the purpose of this consultation, a hibernaculum is a site, most often a cave or mine, where bats hibernate during the winter (see suitable habitat), but could also include bridges and structures if bats are found to be hibernating there during the winter.

   No

7. Is the project located **within** a karst area?

   No

8. Is there *any* suitable[1] summer habitat for Indiana Bat or NLEB **within** the project action area[2]? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   [2] The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR Section 402.02). Further clarification is provided by the User's Guide for the Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat.

   Yes

9. Will the project remove *any* suitable summer habitat[1] and/or remove/trim any existing trees **within** suitable summer habitat?

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   Yes

10. Will the project clear more than 20 acres of suitable habitat per 5-mile section of road/rail?

    No

11. Have presence/probable absence (P/A) summer surveys[1][2] been conducted[3][4] **within** the suitable habitat located within your project action area?

    [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

    [2] Presence/probable absence summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate distance from hibernacula) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    [3] For projects within the range of either the Indiana bat or NLEB in which suitable habitat is present, and no bat surveys have been conducted, the transportation agency will assume presence of the appropriate species. This assumption of presence should be based upon the presence of suitable habitat and the capability of bats to occupy it because of their mobility.

    [4] Negative presence/probable absence survey results obtained using the summer survey guidance are valid for a minimum of two years from the completion of the survey unless new information (e.g., other nearby surveys) suggest otherwise.

    Yes

    SUBMITTED DOCUMENTS

    - *608491_rpt_mendon_nleb_survey_20210922.pdf https://ipac.ecosphere.fws.gov/project/5DMAN7E2P5FVDJ3DP4HOSHEF44/projectDocuments/115741894*

12. Did the presence/probable absence (P/A) summer surveys detect Indiana bats and/or NLEB[1]?

    [1] P/A summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate home range) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    No

13. Were the P/A summer surveys conducted **within** the fall swarming/spring emergence range of a documented Indiana bat hibernaculum[1]?

    [1] Contact the local Service Field Office for appropriate distance from hibernacula.

    No

14. Does the project include activities **within documented NLEB habitat**[1][2]?

    [1] Documented roosting or foraging habitat – for the purposes of this consultation, we are considering documented habitat as that where Indiana bats and/or NLEB have actually been captured and tracked using (1) radio telemetry to roosts; (2) radio telemetry biangulation/triangulation to estimate foraging areas; or (3) foraging areas with repeated use documented using acoustics. Documented roosting habitat is also considered as suitable summer habitat within 0.25 miles of documented roosts.)

    [2] For the purposes of this key, we are considering documented corridors as that where Indiana bats and/or NLEB have actually been captured and tracked to using (1) radio telemetry; or (2) treed corridors located directly between documented roosting and foraging habitat.

    No

15. Will the removal or trimming of habitat or trees occur **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors?

    Yes

16. What time of year will the removal or trimming of habitat or trees **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors occur?

    C) During both the active and inactive seasons

17. Will *any* tree trimming or removal occur **within** 100 feet of existing road/rail surfaces?

    Yes

18. Will *any* tree trimming or removal occur **between** 100-300 feet of existing road/rail surfaces?

    No

19. Are *all* trees that are being removed clearly demarcated?

    Yes

20. Will the removal of habitat or the removal/trimming of trees involve the use of **temporary** lighting?

    Yes

21. Will the removal of habitat or the removal/trimming of trees include installing new or replacing existing **permanent** lighting?

    No

22. Does the project include wetland or stream protection activities associated with compensatory wetland mitigation?

    No

23. Does the project include slash pile burning?

    No

24. Does the project include *any* bridge removal, replacement, and/or maintenance activities (e.g., any bridge repair, retrofit, maintenance, and/or rehabilitation work)?

    No

25. Does the project include the removal, replacement, and/or maintenance of *any* structure other than a bridge? (e.g., rest areas, offices, sheds, outbuildings, barns, parking garages, etc.)

    No

26. Will the project involve the use of *any* **temporary** lighting in addition to the lighting already indicated for habitat removal (including the removal or trimming of trees), or bridge/structure removal, replacement or maintenance activities?

    Yes

27. Is there *any* suitable habitat **within** 1,000 feet of the location(s) where **temporary** lighting (other than the lighting already indicated for habitat removal (including the removal or trimming of trees) or bridge/structure removal, replacement or maintenance activities) will be used?

    Yes

28. Will the project install new or replace existing **permanent** lighting?

    No

29. Does the project include percussives or other activities (**not including tree removal/ trimming or bridge/structure work**) that will increase noise levels above existing traffic/ background levels?

    Yes

30. Will the activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the active season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

31. Will *any* activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the inactive season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

32. Are *all* project activities that are **not associated with** habitat removal, tree removal/ trimming, bridge and/or structure activities, temporary or permanent lighting, or use of percussives, limited to actions that DO NOT cause any additional stressors to the bat species?

    Examples: lining roadways, unlighted signage , rail road crossing signals, signal lighting, and minor road repair such as asphalt fill of potholes, etc.

    Yes

33. Will the project raise the road profile **above the tree canopy**?

    No

34. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the active season within undocumented habitat.

35. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) and/or increase noise levels above existing traffic/background levels consistent with a No Effect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the inactive season

36. Is the location of this project consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because no bats were detected during presence/probable absence surveys conducted during the summer survey season and outside of the fall swarming/spring emergence periods. Additionally, all activities were at least 0.5 miles from any hibernaculum.

37. **General AMM 1**
    Will the project ensure *all* operators, employees, and contractors working in areas of known or presumed bat habitat are aware of *all* FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable Avoidance and Minimization Measures?

    Yes

Project Questionnaire

1. Have you made a No Effect determination for *all* other species indicated on the FWS IPaC generated species list?

   N/A

2. Have you made a May Affect determination for *any* other species on the FWS IPaC generated species list?

   N/A

3. How many acres[1] of trees are proposed for removal between 0-100 feet of the existing road/rail surface?

   [1] If described as number of trees, multiply by 0.09 to convert to acreage and enter that number.

   1.5

Avoidance And Minimization Measures (AMMs)

This determination key result includes the committment to implement the following Avoidance and Minimization Measures (AMMs):

GENERAL AMM 1

Ensure all operators, employees, and contractors working in areas of known or presumed bat habitat are aware of all FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable AMMs.

Determination Key Description: FHWA, FRA, FTA Programmatic Consultation For Transportation Projects Affecting NLEB Or Indiana Bat

This key was last updated in IPaC on April 28, 2022. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the threatened **Northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

IPaC User Contact Information

Agency: Massachusetts Department of Transportation
Name: Trevor Burns
Address: 10 Park Plaza
City: Boston
State: MA
Zip: 02116
Email trevor.b.burns@dot.state.ma.us
Phone: 8574885122

Lead Agency Contact Information

Lead Agency: Federal Highway Administration

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MASSACHUSETTS

DEPARTMENT OF ENVIRONMENTAL PROTECTION

NOTICE OF INTENT

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HNTB Corporation
The HNTB Companies
Engineers Architects Planners

300 Apollo Drive
Chelmsford, MA 01824

Telephone (617) 542-6900
Facsimile (617) 428-6905
www.hntb.com

July 25, 2024

Isabella Genova, Conservation Agent
Mendon Conservation Commission
20 Main Street
Mendon, MA 01756

Subject: Resurfacing and Related Work on Route 16
Massachusetts Department of Transportation – Highway Division (MassDOT)
Notice of Intent

Dear Ms. Genova,

On behalf of the Massachusetts Department of Transportation—Highway Division (MassDOT), HNTB is submitting the enclosed Notice of Intent (NOI) in accordance with the Massachusetts Wetlands Protection Act (WPA) for resurfacing and related work on Route 16 (Project). The project's purpose is to improve safety, operations, and connectivity for all users, consistent with MassDOT's Healthy Transportation Directive (P-13-0001).

The Project begins at Route 16 in Mendon just west of Taft Avenue and continues east for 1.9 miles on Route 16 to the Hopedale Town Line before terminating just east of Harrington Street (Site). An aerial map of the Site is provided in the attached narrative.

Project activities will include pavement repair and resurfacing, bicycle and pedestrian accommodations, including a shared-use path, and reconstruction of the signalized intersections to include new traffic signal equipment and address issues from previous road safety audits (Project). Additionally, the Project includes drainage improvements along the corridor, vegetation clearing to improve sight distances and work on two existing culverts to accommodate the widening necessary for the shared-use path. It should be noted that several of the proposed project activities are considered to be exempt as minor activities in the buffer zone and Riverfront Area per 310 CMR 10.02(2)(b)2. and 310 CMR 10.58(6)(b). These activities include the installation of directly embedded utility poles (310 CMR 10.02(2)(b)2.h), the installation of underground utilities within the existing roadway (310 CMR 10.02(2)(b)2.i), the installation of signs (310 CMR 10.02(2)(b)2.o), and pavement resurfacing and reclamation (310 CMR 10.02(2)(b)2.p). The non-exempt activities include the installation of a shared-use path, sidewalk, drainage improvements, and culvert work.

Non-exempt project activities will result in 57,795 ft^2 of permanent impacts and 2,896 ft^2 of temporary impacts to the 100-foot Buffer Zone, 15,380 ft^2 of permanent impacts and 981 ft^2 of temporary impacts to the 200-foot Riverfront Area, 503 ft^2 of permanent impacts and 90 ft^2 of temporary impacts to Bordering Land Subject to Flooding, 96 ft^2 of temporary impacts to Land Under Water, and 35 lf of temporary impacts to Bank. The Project qualifies as a *Limited Project* pursuant to 310 CMR 10.53(3)(d), 310 CMR 10.53(3)(f), 310 CMR 10.53(3)(i), and 310 CMR 10.53(3)(k) and thus may be permitted without fully meeting the resource area performance standards. Additionally, the compensatory Bordering Land Subject to Flooding plan will create a net gain of 129.53 ft^3 of flood storage capacity.

As an agency of the Commonwealth providing essential government functions, MassDOT is exempt from certain municipal requirements, including but not limited to wetland bylaws, ordinances, and policies, and

for paying peer review fees. Additionally, MassDOT is not required to notify abutters per the WPA Regulations at 310 CMR 10.05(4).

Please advertise this matter and place it on the agenda for the next scheduled Conservation Commission meeting. We look forward to discussing the project with the Commission at that time. For additional information, please contact me at (617) 981-0653 or mseifert@hntb.com. Thank you for your consideration of this request.

Sincerely,



Marissa Seifert, PWS
Wetland Scientist

CC: Erica Larner, MassDOT
MassDEP Central Regional Office

Resurfacing and Related Work on Route 16 (Uxbridge Road)

Mendon, MA
MassDOT Project #608491

NOTICE OF INTENT

July 2024

PREPARED FOR:

Massachusetts Department of Transportation – Highway Division
10 Park Plaza
Boston, Massachusetts 02116

Phone: (857) 268 - 1729
Contact: Erica Larner

PREPARED BY:

HNTB Corporation
31 Saint James Avenue
Boston, Massachusetts 02116

Phone: (617) 981 - 0653
Contact: Marissa Seifert

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Appendices

Appendix A – Figures
Appendix B – Wetland Delineation Report, Memorandum, and Affidavit
Appendix C – Project Design Plans
Appendix D – Landscape Plans
Appendix E – Stormwater Management Report
Appendix F – Supplemental Information for Streamlined Massachusetts Endangered Species Act/Wetland Protection Review

Part A: WPA Form 3 and Wetland Fee Transmittal Form

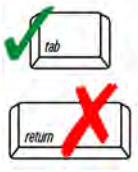
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Mendon
City/Town

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



Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

a. Street Address	b. City/Town	c. Zip Code
Route 16 (Uxbridge Road)	Mendon	01756

Latitude and Longitude:

d. Latitude	e. Longitude
42.107782	-71.553568

f. Assessors Map/Plat Number	g. Parcel /Lot Number
N/A (roadway)	N/A (roadway)

2. Applicant:

a. First Name	b. Last Name
Erica	Larner

c. Organization: Massachusetts Department of Transportation - Highway Division

d. Street Address: 10 Park Plaza, Room 7360

e. City/Town	f. State	g. Zip Code
Boston	MA	02116

h. Phone Number	i. Fax Number	j. Email Address
(857) 268-1729	N/A	erica.n.larner@dot.state.ma.us

3. Property owner (required if different from applicant): ☐ Check if more than one owner

a. First Name	b. Last Name

c. Organization: Massachusetts Department of Transportation - Highway Divison

d. Street Address: 10 Park Plaza

e. City/Town	f. State	g. Zip Code
Boston	MA	02116

h. Phone Number	i. Fax Number	j. Email address

4. Representative (if any):

a. First Name	b. Last Name
Marissa	Seifert

c. Company: HNTB

d. Street Address: 31 Saint James Avenue, Suite 300

e. City/Town	f. State	g. Zip Code
Boston	MA	02116

h. Phone Number	i. Fax Number	j. Email address
(617) 981-0653		mseifert@hntb.com

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid
$750.00	$362.50	$387.50

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Mendon
City/Town

A. General Information (continued)

6. General Project Description:

MassDOT is proposing to reconstruct Route 16 due to gaps in the sidewalk network and limited crosswalks which negatively impact pedestrian connectivity. The purpose of the Project is to improve safety, operations, and connectivity for all users, consistent with MassDOT's Healthy Transportation Directive.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☒ Transportation
9. ☐ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☒ Yes ☐ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

310 CMR 10.53(3)(f) - "maintenance and improvement of existing public roadways."

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

N/A - Roadway
a. County

b. Certificate # (if registered land)

c. Book

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Massachusetts Department of Environmental Protection
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WPA Form 3 – Notice of Intent

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Provided by MassDEP:
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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☒ Bank	35 LF (temp) 0 LF (perm)	0 LF 2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☒ Land Under Waterbodies and Waterways	96 sf (temp) 0 sf (perm) 0 cy 3. cubic yards dredged	0 sf 2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☒ Bordering Land Subject to Flooding	90 sf (temp) 503 sf (perm) 36.95 cf 3. cubic feet of flood storage lost	34.32 sf 2. square feet 148.28 cf 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. ☒ Riverfront Area	Muddy Brook (inland) 1. Name of Waterway (if available) - **specify coastal or inland**	

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☒ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: 179,214 sf (square feet)

4. Proposed alteration of the Riverfront Area:

a. square feet within 100 ft.	b. square feet within 100 ft.	c. square feet between 100 ft. and 200 ft.
15,380 sf (perm), 981 sf (temp)	8,828 sf (perm), 557 sf (temp)	6,552 sf (perm), 421 sf (temp)

5. Has an alternatives analysis been done and is it attached to this NOI? ☒ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☒ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

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WPA Form 3 – Notice of Intent

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Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Mendon
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

Massachusetts Department of Environmental Protection
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Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

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C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   a. ☒ Yes ☐ No

   If yes, include proof of mailing or hand delivery of NOI to:

   Natural Heritage and Endangered Species Program
   Division of Fisheries and Wildlife
   1 Rabbit Hill Road
   Westborough, MA 01581

   September 2023 (MassGIS)

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

      1. ☒ Percentage/acreage of property to be altered:

         (a) within wetland Resource Area: 100%/0.75 acres (percentage/acreage)

         (b) outside Resource Area: 0%/0.00 acres (percentage/acreage)

      2. ☒ Assessor's Map or right-of-way plan of site

2. ☒ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

   (a) ☒ Project description (including description of impacts outside of wetland resource area & buffer zone)

   (b) ☒ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

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Provided by MassDEP:

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City/Town

C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

Note: MassDOT is exempt from MESA filing fees due to ISA.

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☒ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☐ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

Massachusetts Department of Environmental Protection
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Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Mendon
City/Town

C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

   a. ☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

   b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

   a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

   a. ☐ Yes ☒ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

   a. ☒ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

      1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

      2. ☒ A portion of the site constitutes redevelopment

      3. ☐ Proprietary BMPs are included in the Stormwater Management System.

   b. ☐ No. Check why the project is exempt:

      1. ☐ Single-family house

      2. ☐ Emergency road repair

      3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

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Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

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Mendon
City/Town

D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Environmental Site Plans
a. Plan Title

HNTB
b. Prepared By

James Barnack, PE
c. Signed and Stamped by

July 2024
d. Final Revision Date

1:40
e. Scale

f. Additional Plan or Document Title

g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☒ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

E. Fees

1. ☐ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

525381
2. Municipal Check Number

4/30/2024
3. Check date

523959
4. State Check Number

3/29/2024
5. Check date

HNTB Corporation
6. Payor name on check: First Name

7. Payor name on check: Last Name

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Mendon
City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant	2. Date: 07/24/2024
3. Signature of Property Owner (if different)	4. Date
5. Signature of Representative (if any)	6. Date: 07/24/2024

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the “yes” box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

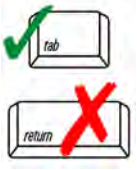
The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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



A. Applicant Information

1. Location of Project:

Route 16 (Uxbridge Road)	Mendon
a. Street Address	b. City/Town
Town: 525381, State: 523959	$750.00
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Erica	Larner
a. First Name	b. Last Name

Massachusetts Department of Transportation - Highway Division
c. Organization

10 Park Plaza, Room 7360
d. Mailing Address

Boston	MA	02116
e. City/Town	f. State	g. Zip Code

(857) 268-1729	N/A	erica.n.larner@dot.state.ma.us
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

a. First Name	b. Last Name

MassDOT Department of Transportation
c. Organization

10 Park Plaza
d. Mailing Address

Boston	MA	02116
e. City/Town	f. State	g. Zip Code

h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
2e - inland limited project	1	x1.5	$750.00

Step 5/Total Project Fee: $750.00

Step 6/Fee Payments:

Total Project Fee:	$750.00 (a. Total Fee from Step 5)
State share of filing Fee:	$362.50 (b. 1/2 Total Fee **less $**12.50)
City/Town share of filling Fee:	$387.50 (c. 1/2 Total Fee **plus** $12.50)

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

Proposal No. 608491-131468

A00860 - 20

THE FACE OF THIS DOCUMENT HAS A COLORED BACKGROUND ON WHITE PAPER

HNTB

HNTB Corporation
715 KIRK DRIVE
KANSAS CITY MO 64105

COMMERCE BANK
KANSAS CITY ST JOSEPH

523959

36-1870
1012

DATE	CHECK NO.	AMOUNT
29-MAR-2024	523959	$*********362.50

PAY Three Hundred Sixty-Two Dollars And Fifty Cents*****

TO THE ORDER OF
COMMONWEALTH OF MASSACHUSETTS
DEPT OF ENVIRONMENTAL PROTECTION
PO BOX 4062
BOSTON, MA 02211

Craig W. Denson

THE BACK OF THIS DOCUMENT CONTAINS AN ARTIFICIAL WATERMARK—HOLD AT AN ANGLE TO VIEW

⑈523959⑈ ⑆101218704⑆ 4300000 19⑈

THE FACE OF THIS DOCUMENT HAS A COLORED BACKGROUND ON WHITE PAPER

HNTB

HNTB Corporation
715 KIRK DRIVE
KANSAS CITY MO 64105

COMMERCE BANK
KANSAS CITY ST JOSEPH

525381

36-1870
1012

DATE	CHECK NO.	AMOUNT
30-APR-2024	525381	$*********387.50

PAY Three Hundred Eighty-Seven Dollars And Fifty Cents*****

TO THE ORDER OF
TOWN OF MENDON
20 MAIN ST
MENDON, MA 01756

Craig W. Denson

THE BACK OF THIS DOCUMENT CONTAINS AN ARTIFICIAL WATERMARK—HOLD AT AN ANGLE TO VIEW

⑈525381⑈ ⑆101218704⑆ 4300000 19⑈

Part B: Notice of Intent Narrative

1. Introduction

In accordance with the Massachusetts Wetlands Protection Act (WPA) (M.G.L. Chapter 131, Section 40) and the implementing regulations (310 CMR 10.00), the Massachusetts Department of Transportation – Highway Division (MassDOT) is submitting this Notice of Intent (NOI) to the Mendon Conservation Commission. MassDOT is requesting authorization to perform work in jurisdictional areas subject to the WPA along Route 16 in Mendon, Massachusetts (the Site). The purpose and need of the Project is to improve safety, operations, and connectivity for all users, consistent with MassDOT's Healthy Transportation Directive (P-13-0001). Specifically, the Project will enhance safety and connectivity by closing gaps in the sidewalk network and improve bicycle accommodations by providing a shared-use path, encourage safe vehicle speeds by updating intersection geometrics to MassDOT standards at all intersections throughout the Site, improve pavement conditions and rideability of Route 16, and improve and update existing utility infrastructure throughout the Site.

MassDOT is proposing to reconstruct and resurface Route 16 in Mendon, Massachusetts. The Site consists of 2.02 miles of Route 16 between Taft Avenue and the Hopedale Town Line, as shown on the USGS Project Location Map (Figure 1) in Appendix A. In addition to the main project corridor, the following intersections and their roadway approaches constitute the project limits:

- Route 16 and Hartford Avenue West
- Route 16 and Millville Street
- Route 16 and Emerson Street / Washington Street
- Route 16 and Maple Street
- Route 16 and Main Street / North Avenue

Work will include pavement repair and resurfacing, bicycle, and pedestrian accommodations, including a shared-use path, and reconstruction of the signalized intersections to include new traffic signal equipment and address issues from Road Safety Audits (RSAs). Additionally, the Project includes drainage improvements along the corridor, clearing of vegetation to improve sight distances, and work on two existing culverts to accommodate the widening necessary for the shared-use path. It should be noted that several of the proposed project activities are exempt as minor activities in the buffer zone and RFA per 310 CMR 10.02(2)(b)2. and 310 CMR 10.58(6)(b). These activities include the installation of directly embedded utility poles (310 CMR 10.02(2)(b)2.h), the installation of underground utilities within the existing roadway (310 CMR 10.02(2)(b)2.i), the installation of signs (310 CMR 10.02(2)(b)2.o), and pavement resurfacing and reclamation (310 CMR 10.02(2)(b)2.p).

The non-exempt activities include the installation of a shared-use path, sidewalk, drainage improvements, and culvert work. Non-exempt project activities will result in 57,795 square feet (ft^2) of permanent impacts and 2,896 ft^2 of temporary impacts to the 100-foot Buffer Zone, 15,380 ft^2 of permanent impacts and 981 ft^2 of temporary impacts to the 200-foot RFA, 503 ft^2 of permanent impacts and 90 ft^2 of temporary impacts to Bordering Land Subject to Flooding, 96 ft^2 of temporary impacts to Land Under Water, and 35 linear feet (lf) of temporary impacts to Bank.

Additionally, the Project is characterized as a Limited Project under the following:

- 310 CMR 10.53(3)(d): "the construction, reconstruction, operation and maintenance of

underground and overhead public utilities, such as electrical distribution or transmission lines, or communication, sewer, water and natural gas lines;"

- 310 CMR 10.53(3)(f): "maintenance and improvement of existing public roadways, but limited to widening less than a single lane, adding shoulders, correcting substandard intersections, and improving inadequate drainage systems;"

- 310 CMR 10.53(i): "the maintenance, repair and improvement of structures, including dams and reservoirs and appurtenant works to such dams and reservoirs, buildings, piers, towers, headwalls, bridges, and culverts which existed on the effective date of April 1, 1983," and

- 310 CMR 10.53(k): "the routine maintenance and repair of road drainage structures including culverts and catch basins, drainage easements, ditches, watercourses and artificial water conveyances to ensure flow capacities which existed on the effective date of April 1, 1983."

These types of projects may be permitted without fully meeting the resource area performance standards so long as they will have no adverse effect on specified habitat sites of rare species, the availability of reasonable alternatives to the proposed activity, the extent to which adverse impacts are minimized, and the extent to which mitigation measures are provided contribute to the protection of the WPA.

In addition to filing this NOI, the Project will require the following permits/regulatory approvals: a Preconstruction Notification (PCN) permit application in accordance with Section 404 of the United States Clean Water Act; National Environmental Policy Act (NEPA) Compliance; and the Massachusetts Endangered Species Act (MESA) Review.

The following narrative describes in further detail the existing conditions, proposed activities, and compliance with performance standards.

2. Existing Conditions

The Project begins at Route 16 in Mendon just west of Taft Avenue and continues east for 1.9 miles on Route 16 to the Hopedale Town Line before terminating just east of Harrington Street (Figure 2). The entire length of the Project is approximately 10,676 feet (2.02 miles). The following subsections detail the existing site conditions, the results of a desktop review, and the results of the field delineation conducted in support of the Project.

2.1 Existing Site Conditions

Route 16, also known within Mendon as Uxbridge Road or Milford Street, is an east-west state highway in Massachusetts, spanning Worcester, Middlesex, Norfolk, and Suffolk Counties. Within the Site, Route 16 generally runs east-west with one lane in each direction. Parking is prohibited on both sides of the roadway along the Site. The section of Route 16 in Mendon within the Site has a posted speed limit of 45 miles per hour (mph) from the Uxbridge Town line to Maple Street and drops to 35 mph between Maple Street and North Avenue/Main Street. The posted speed limit east of North Avenue to Granite Street is 50 mph. The speed limit between Granite Street and the Hopedale town line is 40 mph.

An RSA was completed in September 2018 and identified safety issues relating to pavement marking and signage, traffic signal equipment and operations, pedestrians and bicycles, intersection geometry, high speeds, and congestion. There is a sidewalk on the north side of Route 16 for most of the section

between Hartford Avenue West and North Avenue as well as intermittent sidewalks on the south side of the roadway. Currently, there is no bicycle accommodation on Route 16. Route 16 also has several substandard design features including insufficient stopping sight and decision sight distance, instability in the asphalt pavement, and current geometrics of the roadway which have led to excessive vehicle speeds.

There are a mix of commercial, residential, industrial, and recreational properties directly abutting the Site. Three open space parcels directly abut the Site (Figure 8). The Mendon Driving Range, which is privately owned, is located approximately 850 feet south of the Route 16/Washington Street intersection. Founders' Park, owned by the Town of Mendon, is located directly adjacent to the Route 16/North Avenue intersection. Muddy Brook North Conservation Area, also owned by the Town of Mendon, runs parallel along Route 16 from just north of the Route 16/North Avenue intersection to the Mendon Twin Drive-In Theater. Two streams (one intermittent and one perennial) will be impacted as part of the Project. A non-jurisdictional section of an unnamed intermittent stream adjacent to New England Steak & Seafood will be permanently impacted due to the Project, and Muddy Brook, a mapped perennial stream adjacent to the Mendon Twin Drive-In Theater, will be temporarily impacted due to the Project.

2.2 Desktop Review of Resource Areas

According to the United States Geological Survey (USGS) topographic map, the approximate range of elevation for the Site is from 273 to 445 feet above mean sea level (Figure 1). Most of the area to be impacted by the Project consists of the previously cleared and maintained Route 16 right-of-way. The remaining portions of the Project are a mixed use of residential, commercial, and industrial properties. The USGS topographic map also identifies two streams (Muddy Brook and Willow Brook) that cross the project area. Muddy Brook and Willow Brook are identified as a perennial stream and intermittent streams, respectively.

Based on reviews of the Massachusetts Department of Environmental Protection (MassDEP) Wetland Area Maps for Worcester County[1], the Site is mapped as having the following inland resources: Shallow Marsh Meadow or Fen, Wooded Swamp Deciduous, and Wooded Swamp Mixed Trees (Figure 3).

Based on a review of the National Wetland Inventory (NWI) Map provided by the U.S. Fish and Wildlife Service (USFWS), inland wetlands are mapped within and surrounding the Site and have similar boundaries as the inland resources mapped by MassDEP (Figure 4). The wetlands mapped within the Site are classified as palustrine forested, broad-leaved deciduous, seasonally flooded/saturated (PFO1E), palustrine emergent, persistent, seasonally flooded/saturated (PEM1E), riverine, intermittent, streambed, seasonally flooded (R4SBC), and riverine, perennial, unconsolidated bottom, permanently flooded (R5UBH).

The most recently issued Flood Insurance Rate Map[2] produced by the Federal Emergency Management Agency (FEMA), indicates that portions of the Site in the vicinity of Muddy Brook are mapped as Zone AE (Base Flood Elevation (BFE) = 267 feet NAVD88 and 265.5 feet NAVD88), which is characterized as having a 1% annual chance of a flood hazard (also known as the 100-year floodplain) and Regulatory Floodway, which is classified as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height (Figure 5). The BFE for the Site is approximately 267

[1] MassDEP. 2020. Mass DEP Online Map Viewer Wetland and Wetland Change Areas Map. Available at: http://maps.massgis.state.ma.us/images/dep/omv/wetviewer.htm. Accessed November 2022.
[2] Federal Emergency Management Agency, October 2017, National Hazard Flood Layer, Digital Flood Insurance Rate Map. Map 25027C1031E. Effective 7/4/2011. Accessed November 1, 2022.

feet above mean sea level upstream of the culvert at Muddy Brook and approximately 265.5 feet above mean sea level downstream of the culvert at Muddy Brook.

The U.S. Department of Agriculture Natural Resources Conservation Service[3] (USDA – NRCS) Soil Survey for Worcester County has mapped most of the Project as Scituate fine sandy loam, 3 to 8 percent slopes (315B). For a full listing of the soils within and surrounding the Site, refer to Figure 6.

According to the most recently available data provided by the Massachusetts Natural Heritage and Endangered Species Program[4], a small portion of the Project falls within an Estimated Habitat of Rare Wildlife area (EH 673) and Priority Habitat of Rare Species area (PH 858) (Figure 7). There are no Certified or Potential Vernal Pools within or adjacent to the Site. The closest Certified Vernal Pool (CVP 8232) is located approximately 1,800 feet west and the closest Potential Vernal Pool (PVP 14011) is located approximately 200 feet west. Muddy Brook is a designated Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife (SARIS ID #5131300).

The Project is not located within an Area of Critical Environmental Concern[5] (ACEC) or Outstanding Resource Water[6] (ORW). However, the Project is located within several Zone I, Zone II, or Interim Wellhead Protection Areas[7] (Figure 7).

2.3 Field Delineation of Resource Areas and Buffer Zones

A field delineation was conducted on August 7th and October 10th, 2020, and was performed in accordance with methods developed by MassDEP[8] and the USACE[9]. A second field verification was performed on October 4th, 2023, as the original delineation is greater than three (3) years old. The affidavit signed by an HNTB wetland scientist detailing the changes to the original resource lines is included in Appendix B. Wetland resources areas identified within or near the Site included Bordering Vegetated Wetland (BVW), Land Under Water Bodies and Waterways (LUW), Bank, Bordering Land Subject to Flooding (BLSF), and Riverfront Area (RFA). These resources are defined under the WPA as:

- Bordering Vegetated Wetlands (BVW): As defined in 310 CMR 10.55(2)(a), is "freshwater wetlands which border on creeks, rivers, streams, ponds, and lakes. BVW are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants."

- Land Under Water Bodies and Waterways (LUW): As defined in 310 CMR 10.56(2)(a), is "the land beneath any creek, river, stream, pond or lake."

- Bank: As defined in 310 CMR 10.54(2)(a), is "the portion of the land surface which normally abuts and confines a waterbody."

- Bordering Land Subject to Flooding (BLSF): As defined in 310 CMR 10.57(2)(a)(3), is "the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm."

- Riverfront Area (RFA): As defined in 310 CMR 10.58(2), is "the area of land between a river's

[3] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey.
[4] Massachusetts Natural Heritage and Endangered Species Program, Oct. 2017. Massachusetts Natural Heritage Atlas. 14th Edition.
[5] MassGIS (collaboration with DCR and CZM), Sept. 2017. Massachusetts ACECs.
[6] MassGIS, Dec. 2017. Designated Outstanding Resource Waters of Massachusetts.
[7] MassGIS, Oct. 2017. Approved Wellhead Protection Areas (Zone I and IWPAs).
[8] MassDEP, 1995. Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act.
[9] USACE, 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0.

mean annual high-water line and a parallel line measured horizontally outward from the river and a parallel line located 200-feet away."

Wetland resource areas within the Site are summarized in the table below and depicted on the Project Design Plans in Appendix C. Refer to the Wetland Delineation Report and Wetland Delineation Affidavit in Appendix B for details on each delineated wetland area, including written descriptions, photographs, and field data forms.

Table 1. Summary of Resources within Project Area

Wetland Series	WPA Regulated Features					
	BVW	LUW	Bank	BLSF	RFA	100-foot Buffer Zone
HNTB-A	X					X
HNTB-B	X					X
HNTB-C	X					X
HNTB-D	X					X
HNTB-E	X					X
HNTB-F	X					X
HNTB-G	X					X
HNTB-H	X					X
HNTB-I	X					X
HNTB-J	X					X
Muddy Brook		X	X	X	X	X
Willow Brook		X	X			X
Unnamed Stream (Bank Flags 1-3 and 7-10)		X	X			X

It should be noted that a section of the Unnamed Stream (Bank Flags 4 - 7) is not jurisdictional per 310 CMR 10.04 because it is upgradient of all bogs, swamps, wet meadows, and marshes. The upstream portion of the unnamed stream is located within the drainage system in the existing roadway. Once the stream enters HNTB-G, the stream becomes jurisdictional at Bank Flags 1-3 and 7-10.

The WPA establishes 100-foot buffer zones extending from inland resources, including BVW, LUW, and Bank. The WPA states that any activities that are undertaken within 100 feet of an area specified in 310 CMR 10.02(1)(a) will be conducted per 310 CMR 10.02(2)(b), "in a manner so as to reduce the potential for any adverse impacts to the resource area during construction, and with post-construction measures implemented to stabilize any disturbed areas." The WPA also establishes a 200-foot RFA for Muddy Brook. Work within the RFA must meet the performance standards pursuant to 310 CMR 10.58(4).

3. Proposed Conditions

3.1 Proposed Project

The Project proposes an 11-foot travel lane in each direction with a 2-foot shoulder in the eastbound direction and a 5-foot shoulder in the westbound direction. From Hartford Avenue West until the Washington Street/Emerson Street intersection, a two-way left turn lane is proposed. The design will also include an 8-foot shared-use path with a 4-foot grass buffer in the eastbound direction for the length of the Project and a 7-foot sidewalk in the westbound direction from Hartford Avenue West to North Avenue.

Most of the Project will consist of standard mill and overlay with sections of full depth widening in areas where the cross-section is increasing in width. It should be noted that mill and overlay and full depth pavement reconstruction (restricted to areas not being widened) are exempt minor activities per 310 CMR 10.02(2)(b)2.p. Areas of full depth reconstruction with roadway widening are regulated under the WPA.

Both the sidewalk and the shared-use path will be high-mix asphalt (HMA) pavement. To improve safety and traffic operations, five (5) intersections along the corridor will be reconstructed with geometric improvements (Hartford Avenue West, Millville Street, Emerson Street/Washington Street, Maple Street, and Main Street/North Avenue). Traffic signal improvements are proposed at Hartford Avenue West, Maple Street, and North Avenue/Main Street, and Americans with Disability Act of 1990 (ADA) compliant crossings will be constructed at all roadway crossings where pedestrian facilities are present.

3.1.1 Roadway Resurfacing and Reconstruction

The Project proposes the construction of an 8-foot shared-use path for the entire length of the Site, which will require full depth widening. It should be noted that areas of widening are regulated under the WPA, and areas of full depth, provided that it is not widened, are exempt as a minor activity under the WPA. Also, included in the Project is standard mill and overlay throughout the Site and the associated intersections to improve pavement conditions and rideability along Route 16. Per 310 CMR 10.02(2)(b)2.p, mill and overlay is exempt as a minor activity from the WPA. Drainage improvements are also proposed within the right-of-way (ROW).

3.1.2 Drainage Improvements

The Project proposes several improvements to the existing drainage system, including deep sump catch basins, a sediment forebay for pre-treatment with an open-graded infiltration basin, and grassed channels with sediment forebays and check dams for collection and treatment of runoff. All runoff will flow into deep sump catch basins or vegetated conveyance channels, which is an improvement to the existing conditions where only standard catch basins currently exist.

Existing pipes and structures were maintained to the maximum extent possible. The physical constraints of the existing drainage system limited the flexibility of the proposed design. Proposed pipes were placed at the lowest elevation possible to maximize cover, meet all corresponding existing downstream inverts, and adhere to the MassDOT standards.

3.1.3 Culvert Work at Muddy Brook

The Project proposes an 8-foot shared-use path and 4-foot grass buffer strip along the roadway above Muddy Brook. No changes are proposed to the existing culvert's size, capacity, or slope, so the work is not anticipated to have any significant changes to the flow regime on either the upstream or downstream side. No work is being proposed on the downstream side, and work on the upstream side is limited to removal of the existing headwall and installation of concrete retaining walls on either side of the culvert's inlet in its place. The bank and receiving areas are generally stabilized, and no evidence of erosion in the current condition was observed during the site investigation.

3.1.4 Culvert Extension at Unnamed Stream

Similar to the work at Muddy Brook, the Project proposes an 8-foot shared-use path and 4-foot grass buffer strip at the unnamed stream adjacent to HNTB-G. These roadway improvements will result in a

wider roadway cross section, which will require the existing culvert to be extended by approximately 15-foot on the downstream end. Included in the culvert extension will be a new concrete headwall at the downstream end. No changes are proposed to the culvert size (currently a 30" reinforced concrete pipe (RCP)), capacity, or slope, and it is not anticipated to have any significant changes to the flow regime. It should be noted that the section of the stream where the culvert extension will occur is downstream of the roadway yet upgradient of all bogs, swamps, wet meadows, and marshes, and therefore is non-jurisdictional per 310 CMR 10.04.

3.2 Anticipated Construction Sequence

The staging for the Project is formally divided into four stages. The first stage (Phase 1 – Construction Startup) involves the relocation of existing utility poles and overhead wires, tree trimming and tree removal to enable work, and the establishment of erosion and sedimentation controls.

Phase 2 (Median – One Lane Northbound & One Lane Southbound) involves the installation of traffic controls and detours, roadway excavation within the median, full depth concrete paving, granite curbing, and the installation of new guardrail.

Phases 3 and 4 (Southbound and Northbound Sides, respectively) includes the installation of traffic controls and detours, roadway excavation, full depth concrete paving, granite curbing, loaming, and seeding, micro milling, and the installation of new guardrail. Work on both culverts will occur during Phase 3.

The following are assumptions used throughout construction to prepare the staging plans and the construction contract time determination schedule:

- The schedule has been determined based on the contractor having 1,000 feet of work zone setup at any given time. It is assumed the contractor will have two (2) crews working on the linear portion of the corridor.
- It is assumed there will be no night work.
- Bicycle and pedestrian accommodation will be maintained for the duration of construction. In areas of the Route 16 corridor where the contractor cannot provide a dedicated bicycle facility bicycle lane or minimum 4-foot shoulder, a shared travel lane with the appropriate signage will be provided.

4. Project Impacts

The Project is anticipated to result in temporary and permanent impacts to BLSF, LUW, Bank, the 100-foot Buffer Zones to BVW and Bank, and the 200-foot RFA. No impacts to BVW are proposed as part of the Project. Impacts to sensitive environmental resource areas are quantified in the table below.

Table 2. Impact Summary Table

WPA Resource Area	Temporary Impact (sf)	Permanent Impact (sf)	Total Impact (sf)
BLSF	90 sf	503 sf	593 sf
LUW	96 sf	0 sf	96 sf
Bank[1]	35 lf	0 lf	35 lf
100-foot Buffer Zone	2,896 sf	57,795 sf	60,691 sf
200-foot RFA	981 sf	15,380 sf	16,731 sf

Notes: 1. Bank provided in linear feet.

4.1 Bordering Land Subject to Flooding (BLSF)

Portions of the Site are located within BLSF associated with Muddy Brook. The BFE on the upstream side of Muddy Brook is 267.0'. and the BFE on the downstream side of Muddy Brook is 265.5'. Most of these impact areas are associated with the construction of the culvert extension associated with Muddy Brook.

As a result of the Project, there is a net gain of approximately 111.33 ft^3 of flood storage capacity to the floodplain above elevation 262.0'. The floodplain calculations are detailed in Table 3 below. The Project will not alter the hydraulic capacity of the culvert or adversely impact the regulatory floodway or associated floodplain. The Project will not restrict flows so as to cause an increase in flood stage or velocity, and the Project will not impair the ability of wildlife habitat to provide important wildlife habitat functions as the impact areas associated with BLSF are comprised mainly of existing roadway, sidewalk, culvert headwall, and side slopes of Route 16 and do not currently provide any important wildlife habitat functions. The net gain of flood storage resulting from the grading due to the culvert extension of Muddy Brook is located directly adjacent to the net loss of flood storage capacity along Muddy Brook, and all compensatory flood storage is below the BFE.

Table 3. Net Impacts to the 100-year Floodplain

Elevation	Cut (ft^3)	Fill (ft^3)	Net Loss (-)/Gain (+) to Flood Storage Capacity (ft^3)
262 - 263	36.80	6.64	+30.16
263 - 264	27.20	7.06	+20.14
264 - 265	32.08	7.75	+24.33
265 - 266	27.06	7.75	+19.31
266 - 267	25.14	7.75	+17.39
TOTAL	**148.28**	**36.95**	**+111.33**

4.2 Land Under Waterbodies and Waterways (LUW)

The Project will result in temporary impacts to LUW. These impacts are due to dewatering activities at Muddy Brook, including the installation of cofferdams, a 42" ductile iron (DI) bypass pipe, a temporary concrete scour pad, and a dewatering pump. A control of water plan, which further details dewatering methods, can be found on Sheet 33 of the Project Design Plans (Appendix C). There are no permanent impacts to LUW proposed as part of the Project due to the nature of the installation of concrete retaining walls on either side of the culvert's inlet in its place.

4.3 Bank

The Project will result in temporary impacts to Bank associated with Muddy Brook due to dewatering activities at Muddy Brook including the installation of cofferdams, a 42" ductile iron (DI) bypass pipe, a temporary concrete scour pad, and a dewatering pump. No permanent impacts to the Bank associated with Muddy Brook are proposed as part of the Project.

4.4 100-foot Buffer Zone

Portions of the Site are located within the 100-foot buffer zones to BVW and Bank. Most of these areas are associated with the existing roadway and side slopes of Route 16. Total impacts to the 100-foot buffer zones to BVW and Bank are quantified in Table 2.

Please note that impacts to the non-jurisdictional section of the unnamed stream have been included as impacts to the 100-foot buffer zone.

4.5 Riverfront Area (RFA)

Portions of the Site are located within the 200-foot RFA associated with Muddy Brook, a mapped perennial stream. The 200-foot RFA is concurrent with the outer riparian zone and consists mostly of the existing roadway and maintained right-of-way. For areas temporarily impacted by the Project, they will be restored to pre-construction condition, including regrading, and loaming and seeding with a mid-height grassland upland seed mix. This seed mix includes species that are 100% native to Massachusetts and includes a variety of forbs for pollinator habitat. This seed mix is typically used for locations where habitat restoration and a dense vegetated buffer are desired, but very tall grasses are not. Impacts to the RFA are quantified in Table 2.

5. Mitigation

The Project was planned and designed to avoid wetland and waterbody impacts where practicable. Where avoiding impacts was not feasible, MassDOT sought to minimize impacts while completing the Project's purpose.

During construction, erosion and sedimentation controls such as silt fencing and compost filter tubes (or similar) will be utilized. All erosion and sedimentation controls will be removed following completion of the work and all disturbed areas will be permanently stabilized. Locations and details of erosion and sediment controls are shown in Appendix C. The Contractor will be required to provide a Site and project-specific Erosion and Sediment Control Plan, Stormwater Pollution Prevention Plan (SWPPP), and Spill Prevention Control and Clean-Up (SPCC) prior to construction. The Contractor will also inspect the Site and remove any demolition debris or other construction-related materials upon completion.

6. Stormwater

The proposed stormwater system has been designed to match existing drainage patterns and layout as closely as possible to minimize the impacts to the existing roadway. Existing catch basins, drainage manholes, cross culverts, and outfalls have been utilized to the maximum extent practicable. The work associated with the Project will result in a net addition of approximately 1.53 acres (66,646 ft^2) of impervious area. As a result of this increase, several structural Best Management Practices (BMPs) are being proposed to improve water quality, promote groundwater recharge, and enhance sediment

removal within the drainage networks. The BMPs are detailed below in Table 7.

Table 7. Summary of Proposed Structural BMPs

BMP Type	Location	Impervious Catchment Area (ft^2)	Pervious Catchment Area (ft^2)
Infiltration Basin	42.102224, -71.569179	21, 919	14,989
Grass Channel with Sediment Forebays	42.110556, -71.550539	91,854	41,066
Grass Channel with Sediment Forebays	42.101591, -71.569533	1,225	5,430

Appendix E contains the Stormwater Management Report, which further details how the Project will utilize structural and non-structural control measures to manage stormwater in accordance with federal and state requirements.

6.1 Compliance with the Massachusetts Stormwater Management Standards

The Massachusetts Stormwater Management Standards are applicable under the WPA. The proposed reconstruction of the roadway and intersections within the project corridor are classified as 'redevelopment' per Standard 7 of the Massachusetts Stormwater Management Standards and must comply with standards to the maximum extent practicable. Although the proposed addition of pedestrian and bicycle accommodations is considered a 'new development,' compliance with Stormwater Management Standards is required to the maximum extent practicable (MEP) pursuant to 310 CMR 10.05(6)(m)(6), Footpaths, bike paths, and other paths for pedestrian and/or non-motorized vehicle access. Below is a summary of how the Project will comply with the Massachusetts Stormwater Management Standards.

Standard 1: No New Untreated Discharges or Erosion to Wetlands

The proposed design fully meets the requirements of Standard 1, which states that no new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. With deep sump catch basins proposed for all proposed inlets, no new untreated discharges are proposed by the Project. The best management BMPs included in the proposed stormwater management system are designed in accordance with the MassDEP Stormwater Handbook.

Standard 2: Peak Rate Attenuation

The Project meets Standard 2 only to the MEP. This Standard states that stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. The proposed BMP measures will reduce peak flows during small storm events but will provide only negligible reduction of peak flows during larger storm events. The right-of-way constraints limit the ability to provide any additional detention to fully meet the requirements of the standard. Pipe sizing calculations are included in Appendix E to demonstrate that the design provides a closed drainage network with the capacity to convey the stormwater runoff from the Project.

Standard 3: Stormwater Recharge

The proposed design fully meets the requirements of Standard 3, which states that loss of annual recharge to groundwater shall be eliminated or minimized using infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater BMPs, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the MassDEP Stormwater Handbook.

For discharge to the infiltration trench that will overflow to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to 44% is provided via a deep sump catch basin and open graded sediment forebay. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide compliance to the maximum extent practicable for Standards 3 and 6.

The project adds approximately 1.53 acres of impervious surface area. While only a portion of the project is within HSG B soils, the Required Recharge Volume is conservatively assumed to apply for HSG B soils at all infiltration measures within project limits, resulting in a Required Recharge Volume of 1,943 cubic feet. The surface infiltration basin includes a forebay for pretreatment that is sized for 0.1 inch of rainfall over the impervious area that drains to the basin. Static method calculations are included in Appendix E to demonstrate that the surface infiltration basin at BMP 1 and downstream sediment forebay at BMP 1 recharge 2,163 cubic feet of runoff, exceeding the Required Recharge Volume for the project's increase in impervious area. Appendix E also includes Drawdown Calculations to demonstrate that the basins will drain in less than the maximum 72 hours allowed.

Standard 4: Water Quality

The Project meets Standard 4 only to the MEP. Standard 4 states that stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:

- Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan (LTPPP), and thereafter are implemented and maintained;
- Structural stormwater BMPs are sized to capture the required water quality volume as determined in accordance with the MassDEP Stormwater Handbook; and
- Pretreatment is provided in accordance with the MassDEP Stormwater Handbook.

The Infiltration and BMP Basin Sizing Calculations are included in Appendix E. Deep sump catch basins, or a gutter inlet connecting to a manhole with a sump, are provided at all locations where a new catch basin is proposed. The portion of the project that drains to the BMPs includes 2.64 acres of impervious area, almost double the 1.53 acres of impervious area added by the project. All BMP areas are designed to provide at least 63% TSS removal, discharging less than the remainder of the project which uses only deep sump catch basins to remove 25% TSS. Therefore, the weighted average TSS removal is less than 80%.

However, this project improves upon existing conditions by providing more water quality

treatment than the current drainage system provides, by providing 68% TSS removal for an impervious area larger than the impervious area added by the project. The majority of the treatment trains for BMP areas provide TSS removal in excess of 80%, and a table showing the TSS removal for each BMP treatment train is included in the table below. A LTPP is not included because the design requires no post-construction actions beyond MassDOT's standard maintenance activities.

Catchment	Impervious Area (SF)	Water Quality Treatment (%)
BMP 2 Road	91,854	63%
BMP 1 Road	16,174	94%
BMP 1 Basin Direct Flow	1,544	93%

It is further noted that the downstream basin of BMP 2 (the BMP with the largest contributing drainage area), after conveying through the designed grass channel, ultimately discharges to an existing grassed conveyance ditch that will remain in place beyond the grading limits of BMP 2. While no credit is claimed in the calculation for treatment by the existing swale, conveyance in natural grass channels has additional potential stormwater quality and recharge benefits.

For discharge to the outfall to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to at least 25% is provided via a deep sump catch basins. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for BMP management and recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standards 4 and 6.

All measures designed for infiltration are designed for the 1-inch water quality volume, and all conveyance measures with TSS removal credit are designed for the water quality flow resulting from a 1-inch, 24-hour storm. Calculations demonstrating compliance with the standards in the MassDEP BMP manual for all measures removing suspended solids from runoff are included in Appendix E.

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

The proposed design fully meets the requirements of Standard 5, which states that for LUHPPLs, source control and pollution prevention shall be implemented in accordance with the MassDEP Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the MEP. None of the land uses within the project limits have higher potential pollutant loads.

Standard 6: Critical Areas

As a Redevelopment Project, the project meets the 44% TSS removal pretreatment requirements of Standard 6 only to the maximum extent practicable, but fully meets the 1-inch water quality volume requirement for all designed infiltration areas. The grassed channel in BMPs 1 and 2 are designed for the appropriate water quality flow draining to each, as well as the other standards outlined in the MassDEP Stormwater Handbook. Standard 6 states that stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural

stormwater best management practices determined by the Department to be suitable for managing discharges to such areas. Portions of the project discharge to a Coldwater Fishery Resource as designated by the Massachusetts Division of Fisheries and Wildlife (Muddy Brook). Given constraints in grading, available ROW, and the goal of minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for specified BMP measures, including pretreatment, infiltration, and TSS removal could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standard 6.

Standard 7: Redevelopment and Other Projects Subject to the Standards Only to the Maximum Extent Practicable

Standard 7 states that a redevelopment project is required to meet the following Massachusetts Stormwater Management Standards only to the MEP: Standard 2, Standard 3, and the pretreatment and structural BMP requirements of Standards 4, 5, and 6. Existing stormwater discharges would comply with Standard 1 only to the MEP. The proposed redevelopment project would also comply with Standards 2, 3, 4 and 6 to the MEP, as noted with project restraints. All other requirements of the Stormwater Management Standards will be met by the proposed work and improve existing conditions.

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

The Project fully complies with Standard 8, which states that a plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented. The Project will obtain coverage under the Massachusetts National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP). As required under this permit, a SWPPP will be developed and submitted before land disturbance begins. The SWPPP will be developed by the contractor according the MassDOT's specifications and will include the following:

- Construction period pollution prevention measures;
- Erosion and sedimentation control plan drawings;
- Detailed drawings and specifications for erosion control BMPs, and sizing calculations;
- An operation and maintenance plan for erosion and sedimentation controls;
- An inspection schedule; and
- A maintenance schedule.

Standard 9: Operations & Maintenance Plan

The Project fully meets the requirements of Standard 9, which states that a long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed. A project-specific Post Construction Operation and Maintenance Plan is not included because the design requires no post-construction actions beyond MassDOT's standard maintenance activities.

Standard 10: Prohibition of Illicit Discharges

The Project is designed to fully comply with Standard 10, which states that all illicit discharges to the stormwater management system are prohibited. The Project will be designed to be in full compliance with current standards. Any property owners identified with illicit connections will be contacted by MassDOT and disconnected from the MassDOT system unless the property owner obtains the required permits for the connection. An Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to post-construction BMPs.

7. Alternatives Analysis

Three alternatives were analyzed and evaluated as part of the Project scope, including the No-Build alternative. Ultimately, all alternatives except for the preferred alternative were dismissed due to right-of-way acquisitions, additional wetland and environmental impacts, and project cost.

7.1 Alternative 1 (No-Build)

Alternative 1, the No-Build alternative, assumes no changes are made to the existing roadway and/or pavement. No shared-use path, sidewalks, or resurfacing work would be completed. Under this alternative, no safety enhancements would be provided, and connectivity in the sidewalk network would remain as-is. The No-Build alternative would not encourage safe vehicle speeds by updating the intersection geometrics to MassDOT standards, which could lead to increased crashes. Ultimately, this alternative was dismissed as it does not meet MassDOT's Healthy Transportation Directive or the goals of the Project.

7.2 Alternative 2 (Buffered Bike Lanes)

Alternative 2 proposes buffered bike lanes on both sides of Route 16. These bike lanes are at the same grade as the travel lanes and are separated from vehicular traffic by a painted buffer. The corridor from Hartford Avenue West to the Hopedale town line would consist of a 11-foot travel lane, a 5-foot bike lane, and a 3-foot buffer in each direction. A 6-foot sidewalk was proposed on both sides of the roadway. Providing buffered bike lanes and pedestrian accommodations on both sides of the road would result in a wider total corridor cross section with greater impacts to existing wetlands than the current design. Therefore, Alternative 2 was dismissed.

7.3 Alternative 3 (Shared-Use Path, Preferred Alternative)

Alternative 3 includes a shared-use path that provides pedestrians and bicyclists an off-street alternative to move along the corridor. The corridor from Hartford Avenue West to the Hopedale town line will consist of two 11-foot travel lanes with 5-foot shoulders in the westbound direction and 2-foot shoulders in the eastbound direction. An 8-foot shared-use path with a landscaped buffer is proposed along the south side of Route 16. A 7-foot sidewalk is proposed along the north side of the roadway between Hartford Avenue West and North Avenue. The shared-use path option was selected as the preferred alternative because it proposes less impacts to jurisdictional resource areas and allows for increased safety benefits from separating the bicycle accommodations from the roadway.

8. Compliance with General Performance Standards for Work in Resource Areas

The following section details the Project's regulatory compliance with the WPA, including all applicable

resource area performance standards. The Project is subject to jurisdiction under the WPA; however, as a State Agency, MassDOT is exempt from the requirements of the Town of Mendon Bylaws.

In addition, per 310 CMR 10.05(4)(a), abutter notification is not required for projects proposed by the Massachusetts Department of Transportation Highway Division pursuant to St. 1993, c. 472 as approved on January 13, 1994.

8.1 Limited Project Status

The Project is characterized as a Limited Project under the following:

- 310 CMR 10.53(3)(d): "the construction, reconstruction, operation and maintenance of underground and overhead public utilities, such as electrical distribution or transmission lines, or communication, sewer, water and natural gas lines;"
- 310 CMR 10.53(3)(f): "maintenance and improvement of existing public roadways, but limited to widening less than a single lane, adding shoulders, correcting substandard intersections, and improving inadequate drainage systems;"
- 310 CMR 10.53(i): "the maintenance, repair and improvement of structures, including dams and reservoirs and appurtenant works to such dams and reservoirs, buildings, piers, towers, headwalls, bridges, and culverts which existed on the effective date of April 1, 1983," and
- 310 CMR 10.53(k): "the routine maintenance and repair of road drainage structures including culverts and catch basins, drainage easements, ditches, watercourses and artificial water conveyances to ensure flow capacities which existed on the effective date of April 1, 1983."

These types of projects may be permitted without fully meeting the resource area performance standards so long as they will have any no adverse effect on specified habitat sites of rare species, the availability of reasonable alternatives to the proposed activity, the extent to which adverse impacts are minimized, and the extent to which mitigation measures are provided contribute to the protection of the WPA. The Project is believed to meet this criterion as further discussed below.

8.2 Compliance with Performance Standards

The Project qualifies as a Limited Project as described in Section 8.1 and meets performance standards associated with WPA resources to the greatest extent practicable, as described below:

8.2.1 Bordering Land Subject to Flooding (310 CMR 10.57(4)(a))

Performance Standard 1: Performance Standard 1 requires that incremental compensatory flood storage shall be provided for all flood storage volume that will be lost because of a proposed project. Work in BLSF (BFE = 267.0' NAVD88) will result in a 36.95 ft^3 loss of storage between elevations 262.0' and 267.0'. However, the Project will create approximately 148.28 ft^3 of additional flood storage volume between elevations 262.0' and 267.0', resulting in a net increase in flood storage of approximately 111.33 ft^3 (see Table 4). The performance standard has been met, as the project will provide incremental compensatory flood storage at each foot below the BFE.

Performance Standard 2: Performance Standard 2 states that the work will not restrict flow as to increase in flood stage or velocity. The Project does not propose any alterations which will restrict flow

which would result in an increase in flood stage or velocity.

Performance Standard 3: Performance Standard 3 states that work in BLSF found to be significant to the protection of wildlife habitat shall not impair its capacity to provide important habitat functions. All of the work within BLSF is occurring within previously degraded and/or disturbed right-of-way per 310 CMR 10.57(1)(a)3, and thus will not impair the protection of wildlife habitat.

8.2.2 Riverfront Area (310 CMR 10.58(4))

Performance Standard - Protection of Other Resource Areas: This performance standard requires that work shall meet the performance standards for all other resource areas within the RFA, and if work is conducted in the buffer zone of another resource, the RFA shall contribute to the protection of the interests of M.G.L. c. 131, § 40 in lieu of any additional requirements. For locations where work in the RFA is also within the buffer zone to another resource area, the performance standards for the RFA shall contribute to the protection of the interests of M.G.L. c. 131, § 40 in lieu of any additional requirements. The RFA will be loamed and seeded with a mid-height grassland upland seed mix, as described in Section 4.6. Additionally, the Project is a Limited Project per 310 CMR 10.53(3)(f) and impacts to other resources have been avoided and minimized to the greatest extent practicable.

Performance Standard - Protection of Rare Species: This performance standard states that no project may be permitted within the RFA which will have any adverse effect on specified habitat sites of rare wetland or upland species or vernal pool habitat. A portion of the Project (approximately 1.17 acres, 51,056 ft^2) falls within the Natural Heritage and Endangered Species Program Estimated Habitat of Rare Wildlife area and Priority Habitat of Rare Species area and is co-located within the RFA. Approximately 0.75 acres of Estimated Habitat of Rare Wildlife area and Priority Habitat of Rare Species will be permanently altered. A Streamlined MESA filing is being submitted concurrently with this NOI (Appendix F).

Performance Standard - Practicable and Substantially Equivalent Economic Alternatives: This performance standard requires that there must be no practicable and substantially equivalent economic alternative to the Project with less adverse effects on the interests identified in M.G.L. c. 131 § 40. As described in Section 3.0, there are no practicable or substantially equivalent alternatives for the Project and the proposed activities improve existing conditions for both pedestrians and cyclists.

Performance Standard - No Significant Adverse Impact: The performance standard requires that the work, including proposed mitigation measures, must have no significant adverse impact on the RFA to protect the interests identified in M.G.L. c. 131, § 40. The Project does not involve a change in use. There is 179,214 sf of Riverfront Area located within the right-of-way (ROW). 8,124 ft^2 is impervious and work there is considered redevelopment. 10,610 ft^2 is not impervious and is not considered redevelopment. It will not meet 310 CMR 10.58(5)(e) because the project will alter more than 10,000 sf in the Riverfront Area but may be approved by the Conservation Commission because the Project meets the definition of a Limited Project under 310 CMR 10.53(3)(f). No RFA mitigation is proposed as this work meets the definition of a Limited Project per 310 CMR 10.53(3)(f).

310 CMR 10.58(5) Redevelopment Within Previously Developed Riverfront Area; Restoration and Mitigation: The Site is classified as a previously developed RFA, as it contains areas degraded prior to August 7, 1996, by impervious surfaces from the existing pavement. Impacts proposed within the RFA will not result in an increase of degraded or disturbed areas, as the right-of-way is already disturbed and maintained. Please note that there is approximately 10,610 ft^2 of new development in the RFA. The Project will include right-of-way takings within the RFA adjacent to Route 16; these areas include

invasive species, trash from the adjacent roadway, and earthen fill from the original construction of Route 16. Per 310 CMR 10.58(5), a redevelopment project must conform to performance standards. The proposed work in the RFA does not meet all performance standards; however, the work is required to meet the Project's purpose and need.

No significant adverse impact is anticipated on the RFA, as much of it is already an existing roadway right-of-way, previously degraded. Impacts are limited to the areas within 100 feet of the Bank. The existing vegetative area between the edge of pavement and the edge of the Bank will be preserved as best as possible, with those areas temporarily disturbed restored to their natural conditions. The following is a discussion of the performance standards for a Redevelopment Within Previously Developed Riverfront Area project.

Performance Standard – Proposed Work Shall be an Improvement over Existing Conditions: The existing conditions within the Riverfront Area in the Project Area are characterized by invasive species, trash from the adjacent roadway, and earthen fill from the original construction of Route 16. The Project is an improvement from existing conditions, as it will reestablish approximately 9,000 sf of vegetation within the RFA adjacent to the roadway by spreading loam borrow and native seed mixes where some existing areas were observed to be unstable and improve the existing roadway by means of full depth pavement reclamation. The proposed loam and seeding will stabilize the areas of potential erosion and promote a higher biodiversity of native species by the addition of the native seed mix.

Performance Standard – Stormwater Management is Provided: Stormwater will be managed according to the standards established by the Massachusetts Stormwater Management Standards. The Stormwater Management Report detailing compliance with stormwater standards is attached as Appendix E.

Performance Standard – Proposed Work shall not be Located Closer to the River than Existing Conditions or 100-feet: This performance standard is not met as there is proposed work located closer to the river than existing conditions. The proposed work closer to the river includes the installation of an 8-foot shared-use path, a 4-foot grass buffer strip along the roadway above Muddy Brook, the removal of the existing headwall, and the installation of concrete retaining walls on either side of the culvert's inlet in its place. These project components are needed to achieve the project's purpose and need. No significant adverse impact is anticipated to the RFA, as much of the area is already an existing roadway right-of-way, previously degraded, and impacts are limited to the areas within 100 feet from the Bank. The existing vegetative area between the edge of the pavement and the edge of the Bank will be preserved as best as possible, with those areas temporarily disturbed and restored to the natural conditions. The project may be approved by the Conservation Commission because the Project meets the definition of a Limited Project under 310 CMR 10.53(3)(f).

Performance Standard – Proposed Work shall be located outside the riverfront area or toward the riverfront area boundary and away from the river, except in accordance with 310 CMR 10.58(5)(f) or (g): This performance standard is not met as there is proposed work located inside of the Riverfront Area and closer to the river than existing conditions. The proposed work closer to the river includes the installation of an 8-foot shared-use path, a 4-foot grass buffer strip along the roadway above Muddy Brook, the removal of the existing headwall, and the installation of concrete retaining walls on either side of the culvert's inlet in its place. These project components are needed to achieve the Project's purpose and need. No significant adverse impact is anticipated to the RFA, as much of the area is already an existing roadway right-of-way, previously degraded, and impacts are limited to the areas within 100-feet from the Bank. The existing vegetative area between the edge of the pavement and the edge of the Bank will be preserved as best as possible, with those areas temporarily disturbed and

restored to the natural conditions. The project may be approved by the Conservation Commission because the Project meets the definition of a Limited Project under 310 CMR 10.53(3)(f).

Performance Standard - The area of proposed work shall not exceed the amount of degraded area, provided that the proposed work may alter up to 10% if the degraded area is less than 10% of the riverfront area: The total amount of RFA on the site of the proposed project is 179,214 sf, of that approximately 12,493 sf (approximately 7% of the RFA) is considered degraded. The project proposes to alter approximately 16,361 sf (15,380 sf of permanent and 981 sf of temporary impacts), which is approximately 9.5% of the total Riverfront Area. Although the proposed alteration exceeds the amount of degraded area, the degraded area is less than 10% of the RFA, and therefore, the proposed work may alter up to 10% of the Riverfront Area. Therefore, this performance standard is met because the proposed work will alter approximately 9.5% of the total Riverfront Area.

Performance Standard – Restoration On-Site of Degraded Riverfront Area: Temporary impacts to the RFA will be restored in place to their natural conditions and the existing vegetation between the edge of pavement and the edge of the Bank will be preserved as best as possible. Additionally, loam borrow and native seed mixes are to be spread where some existing areas were observed to be unstable. Temporary impacts will be restored at a ratio of 1:1 and shall include the coverage by topsoil at a depth consistent with natural conditions at the site and seeding with an appropriate seed mixture. Therefore, this performance standard is met.

Performance Standard - Mitigation either On-site or in the Riverfront Area: Not Applicable. There is no Riverfront mitigation proposed as part of this project.

8.2.3 Bank (310 CMR 10.54(4))

Performance Standard 1: Performance Standard 1 requires that the proposed work will not impair the physical stability of the Bank. As no changes are proposed to the culvert at Muddy Brook's size, capacity, or slope, the Project will not impair the physical stability of the Bank at Muddy Brook.

Performance Standard 2: Performance Standard 2 requires that the proposed work will not impair the water-carrying capacity of the existing channel within the Bank. As no changes are proposed to either culvert's size, capacity, or slope, the Project will not impair the water carrying capacity of the existing channel within the Bank.

Performance Standard 3: Performance Standard 3 requires that the proposed work will not impair the ground and surface water quality. The Project will result in a net addition of approximately 1.53 acres (66,646 ft^2) of impervious area. As a result of this increase, several structural BMPs are being proposed to improve water quality, promote groundwater recharge, and enhance sediment removal within the drainage networks. Stormwater management is discussed further in Section 6.0 and in the Stormwater Management Report (Appendix E). The proposed BMPs will result in an improvement over the Site's current conditions.

Performance Standard 4: Performance Standard 4 requires that the proposed work will not impair the capacity of the Bank to provide breeding habitat, escape cover, or food for fisheries. The Project will not permanently impact breeding habitat, escape cover, or food for fisheries, as neither culvert's diameter, capacity, or slope is being altered. The Project may temporarily impact breeding habitat, escape cover, or food for fisheries due to the installation of cofferdams, a 42" ductile iron (DI) bypass pipe, and a dewatering pump. A control of water plan can be found on Sheet 33 of the Project Design Plans (Appendix C), which further details dewatering methods and fish protection.

Performance Standard 5: Performance Standard 5 requires that the proposed work will not impair the capacity of the Bank to provide important wildlife habitat functions. The Project may temporarily impair capacity of the Bank to provide important wildlife habitat functions, as the area will be heavily disturbed during dewatering activities, which is described further in Section 4.4. Bank habitat impacts at Muddy Brook are temporary in nature only and will be restored to existing conditions once construction is complete.

Performance Standard 6: Not Applicable. Performance Standard 6 requires that the proposed work will meet the Massachusetts Stream Crossing Standards. However, there are no changes are proposed to the culvert at Muddy Brook's size, capacity, or slope. Therefore, this performance standard is met.

8.2.4 Land Under Water Bodies and Waterways (310 CMR 10.56(4))

Performance Standard 1: Performance Standard 1 requires that the proposed work will not impair the water-carrying capacity within the defined channel. As no changes are proposed to either the culvert's size, capacity, or slope, the Project will not impair the water-carrying capacity within the channel.

Performance Standard 2: Performance Standard 2 requires that the proposed work will not impair the ground and surface water quality. The Project will result in a net addition of approximately 1.53 acres (66,646 ft^2) of impervious area. As a result of this increase, several structural BMPs are being proposed to improve water quality, promote groundwater recharge, and enhance sediment removal within the drainage networks. Stormwater management is discussed further in Section 6.0 and in the Stormwater Management Report (Appendix E). The proposed BMPs will result in an improvement over the Site's current conditions.

Performance Standard 3: Performance Standard 3 requires that the proposed work will not impair the ability to provide breeding habitat, escape cover, or food for fisheries. The Project will not permanently impact breeding habitat, escape cover, or food for fisheries, as neither culvert's size, capacity, or slope is being altered. The Project may temporarily impact breeding habitat, escape cover, or food for fisheries due to the installation of cofferdams, a 42" ductile iron (DI) bypass pipe, and a dewatering pump. A control of water plan can be found on Sheet 33 of the Project Design Plans (Appendix C), which further details dewatering methods and fish protection.

Performance Standard 4: Performance Standard 4 requires that the proposed work will not impair the ability to provide important wildlife habitat functions. The Project may temporarily impair the ability to provide important wildlife habitat functions, as the area will be heavily disturbed during dewatering activities, which is described further in Section 3.1.3. However, the Project will not permanently impair important wildlife habitat functions associated with LUW, as the Project is not proposing a change in either culvert's size, capacity, or slope and is being pursued as a Limited Project per 310 CMR 10.53(3)(i).

Performance Standard 5: Not Applicable. Performance Standard 5 requires that the proposed work will meet the Massachusetts Stream Crossing Standards. However, there are no changes proposed to the culvert at Muddy Brook's size, capacity, or slope. Therefore, this performance standard is met.

8.2.5 Wildlife Habitat Evaluations (310 CMR 10.60)

Adverse Effects on Wildlife Habitat – This performance standard requires that a wildlife habitat evaluation be performed if the proposed work will have an adverse effect on wildlife habitat beyond the permissible thresholds shown below. Adverse effects on wildlife habitat means the alteration of any

habitat characteristic listed in 310 CMR 10.60(2), insofar as such alteration will, following two growing seasons of project completion and thereafter substantially reduce its capacity to provide the important wildlife habitat functions. As temporary construction activities such as dewatering or the installation of erosion and sedimentation controls will not substantially reduce a resource area's capacity to provide important habitat functions after two growing seasons, temporary impacts to resources were not evaluated.

Table 6. Performance Standard Thresholds for Wildlife Habitat Evaluations

Resource Area	Permissible Threshold	Area of Resource Present On-Site	Area of Permanent Alteration	Requires Wildlife Habitat Evaluation?
BLSF	10% or 5,000 sf (whichever is less)	37,403 ft^2	503 ft^2	No
Riverfront Area	No threshold. However, different review requirements apply depending on whether the Riverfront Area is undisturbed, previously developed, or if the activity is grandfathered or exempted from requirements for the Riverfront Area.	179,214 ft^2	15,380 ft^2	N/A
Bank	10% or 50 linear feet (whichever is less)	676 linear feet	0 linear feet	No
LUW	10% or 5,000 sf (whichever is less)	3,454 ft^2	0 ft^2	No

The proposed work will not impact any resource area beyond the permissible threshold and will not require a wildlife habitat evaluation.

8.3 Massachusetts Endangered Species Act (MESA)

Proposed project activities may be permitted if they will have any no adverse effect on specified habitats of rare species, the availability of reasonable alternatives to the proposed activity have been explored, the extent to which adverse impacts are minimized, and the extent to which mitigation measures are provided (contributing to the protection of the WPA). A portion of the Project (approximately 0.75 acres, 32,872.5 ft^2) falls within the Natural Heritage and Endangered Species Program Estimated Habitat of Rare Wildlife area (EH 673) and Priority Habitat of Rare Species area (PH 858) associated with Muddy Brook. However, the Project will not result in any adverse effects to habitat, as the Project's right-of-way is already disturbed and degraded. As described in Section 7.0, there are no practicable or substantially equivalent alternatives for the Project and the proposed activities improve existing conditions. Supplemental information for the concurrent MESA review has been attached as Appendix F.

9. Summary

The proposed Project along Route 16 will improve safety for all users along the corridor and meet the requirements of MassDOT's Healthy Transportation Directive. Permanent impacts to regulated wetland resources have been minimized to the maximum extent practicable and are limited to 57,795 ft^2 within

the 100-foot Buffer Zone to BVW, 15,380 ft^2 within the 200-foot RFA, and 503 ft^2 within BLSF. MassDOT respectfully requests that the Mendon Conservation Commission find that these measures adequately protect the interests identified in the WPA and issue an Order of Conditions approving the work shown on the accompanying Project Design Plans.

Appendix A – Figures



0 0.25 0.5 0.75 1 Miles

USGS Topographical Map

Resurfacing and Related Work on Route 16

Legend

Project Corridor

N

Note:
- Topographical Survey 7.5 Minute Quadrangles for Blackstone, MA 2021.

Figure 1

HNTB massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022



Aerial Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 2

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022

Legend

Project Corridor

Town Boundaries

0 0.15 0.3 0.45 0.6 Miles

N



MassDEP Wetlands Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 3

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022



NWI Map
Resurfacing and Related Work on Route 16
Mendon, MA

Legend

- Project Corridor
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Lake
- Riverine
- Town Boundaries

0 0.15 0.3 0.45 0.6 Miles

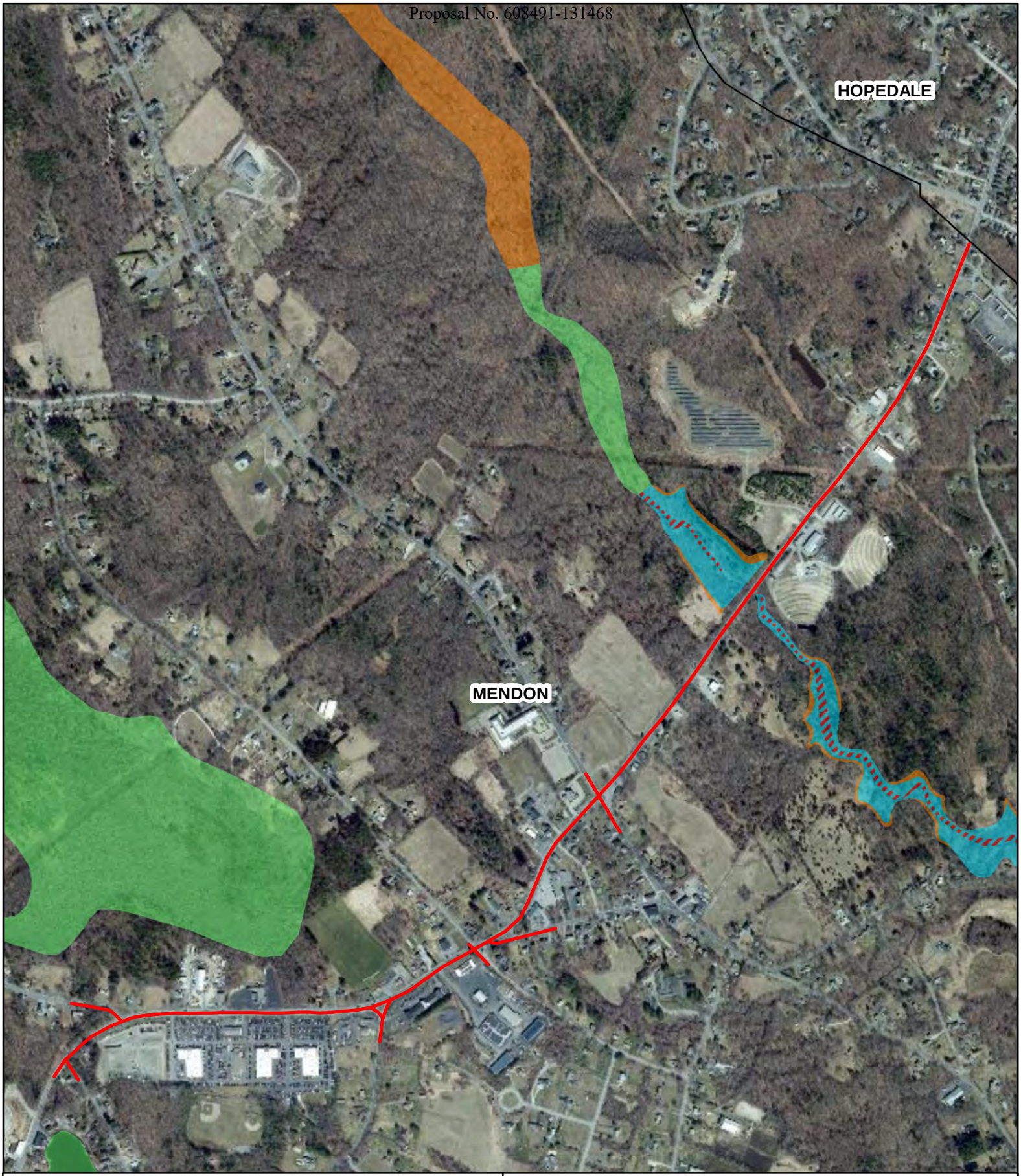
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Figure 4

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022



FEMA Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 5

HNTB

massDOT
Massachusetts Department of Transportation
Highway Division

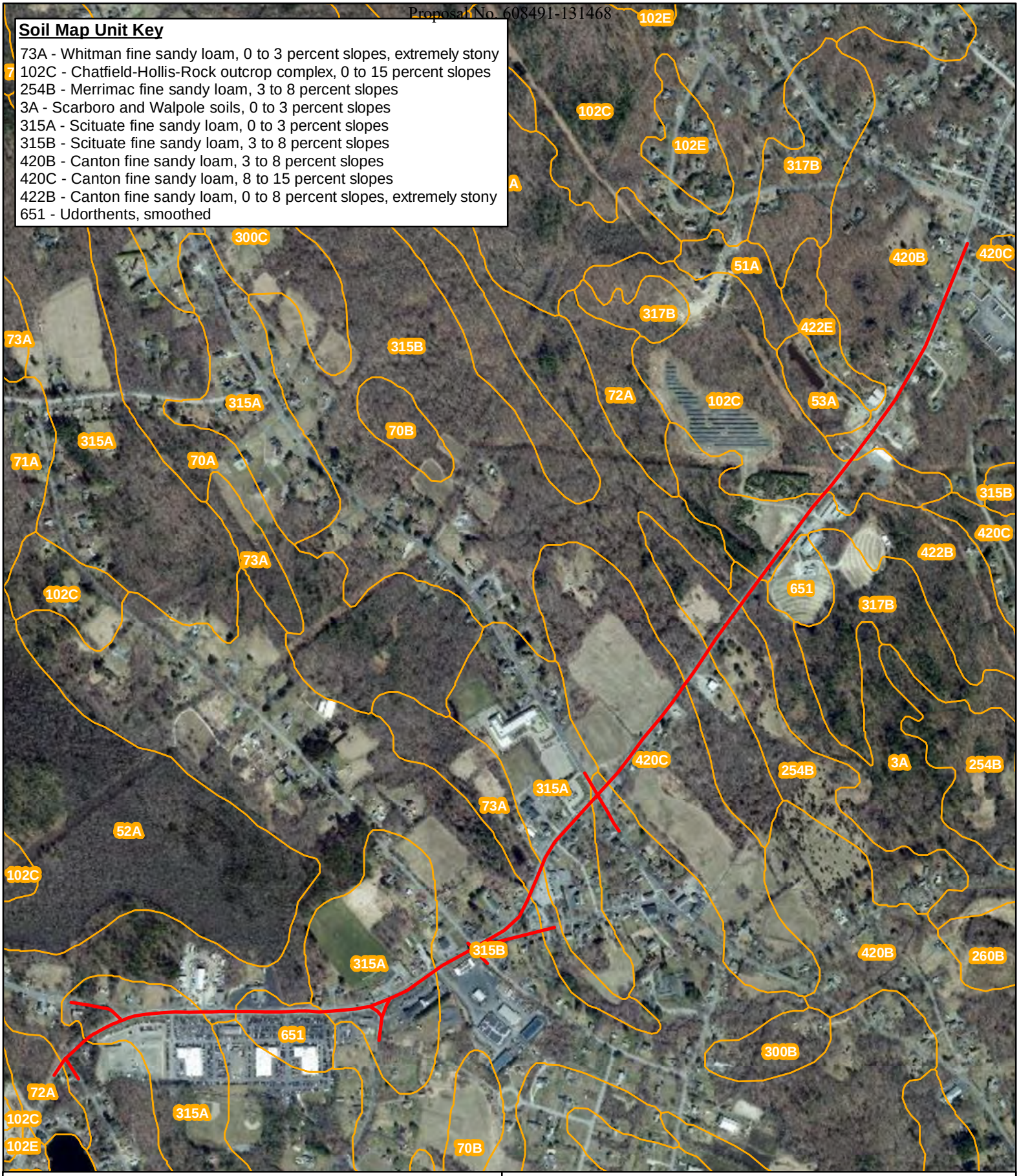
Boston, MA | November 2022

Legend

- Project Corridor
- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- X: 0.2% Annual Chance of Flooding
- Town Boundaries

0 0.15 0.3 0.45 0.6 Miles

N



Soils Map
Resurfacing and Related Work on Route 16
Mendon, MA

Legend

Project Corridor

Soil Map Unit

0 0.15 0.3 0.45 0.6 Miles

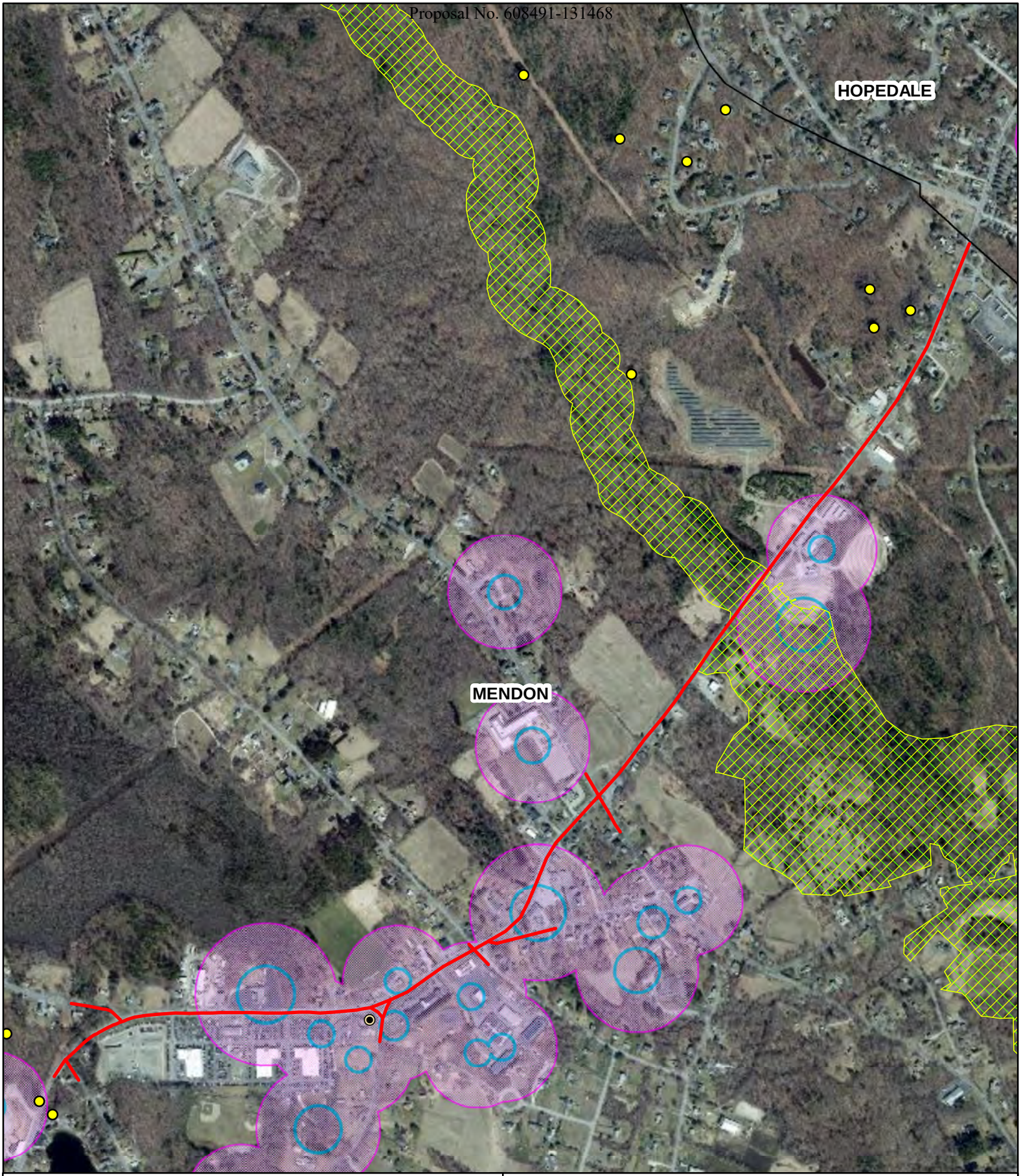
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Figure 6

HNTB

massDOT Massachusetts Department of Transportation Highway Division

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NHESP & Others Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 7

HNTB

massDOT Massachusetts Department of Transportation Highway Division

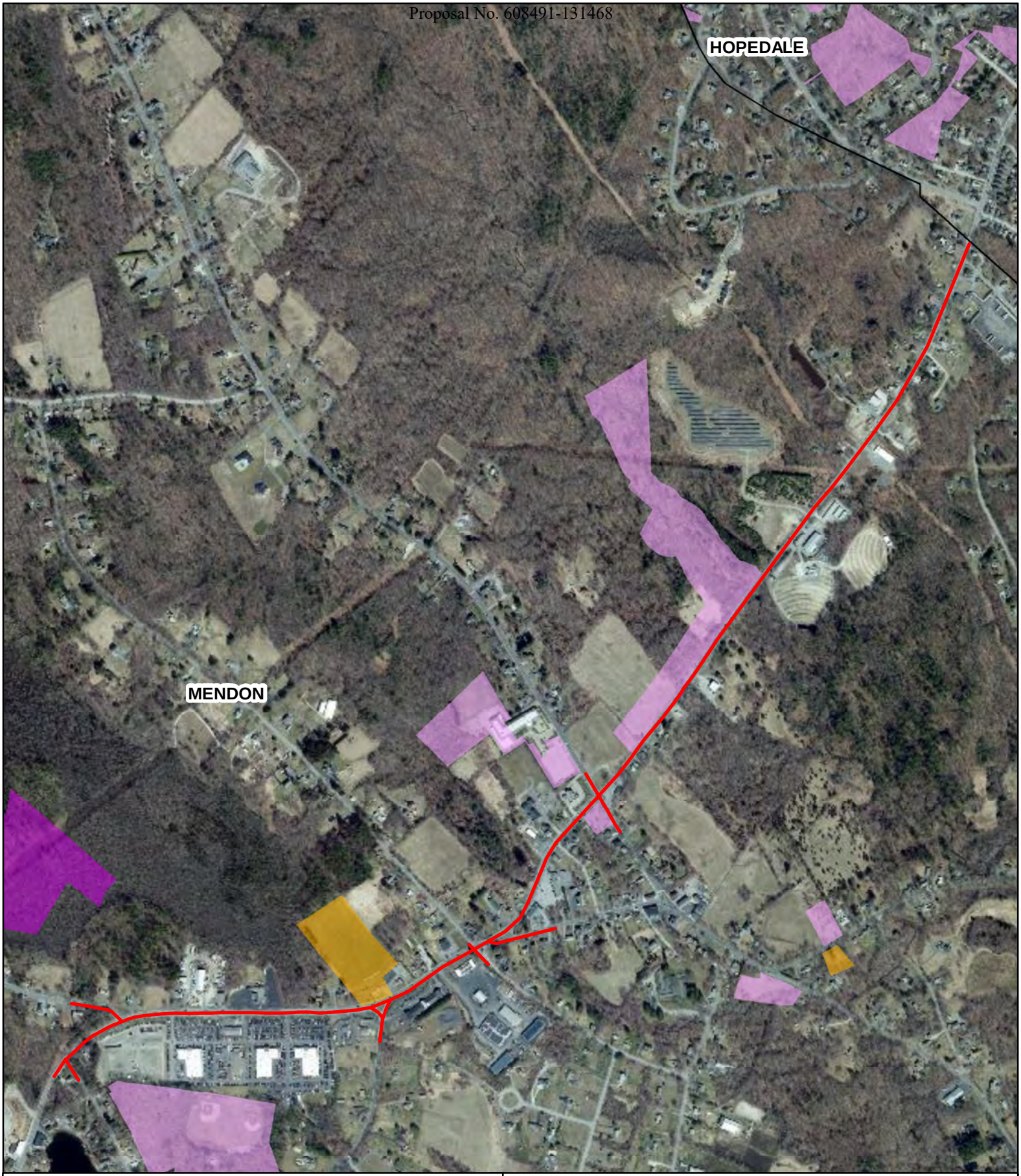
Boston, MA | November 2022

Legend

- Potential Vernal Pool
- Underground Storage Tank
- Project Corridor
- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- DEP Zone I Wellhead Protection Area
- DEP Zone II Wellhead Protection Area
- Interim Wellhead Protection Area
- Town Boundaries

0 0.15 0.3 0.45 0.6 Miles

N



Open Space by Ownership Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 8

HNTB

massDOT Massachusetts Department of Transportation Highway Division

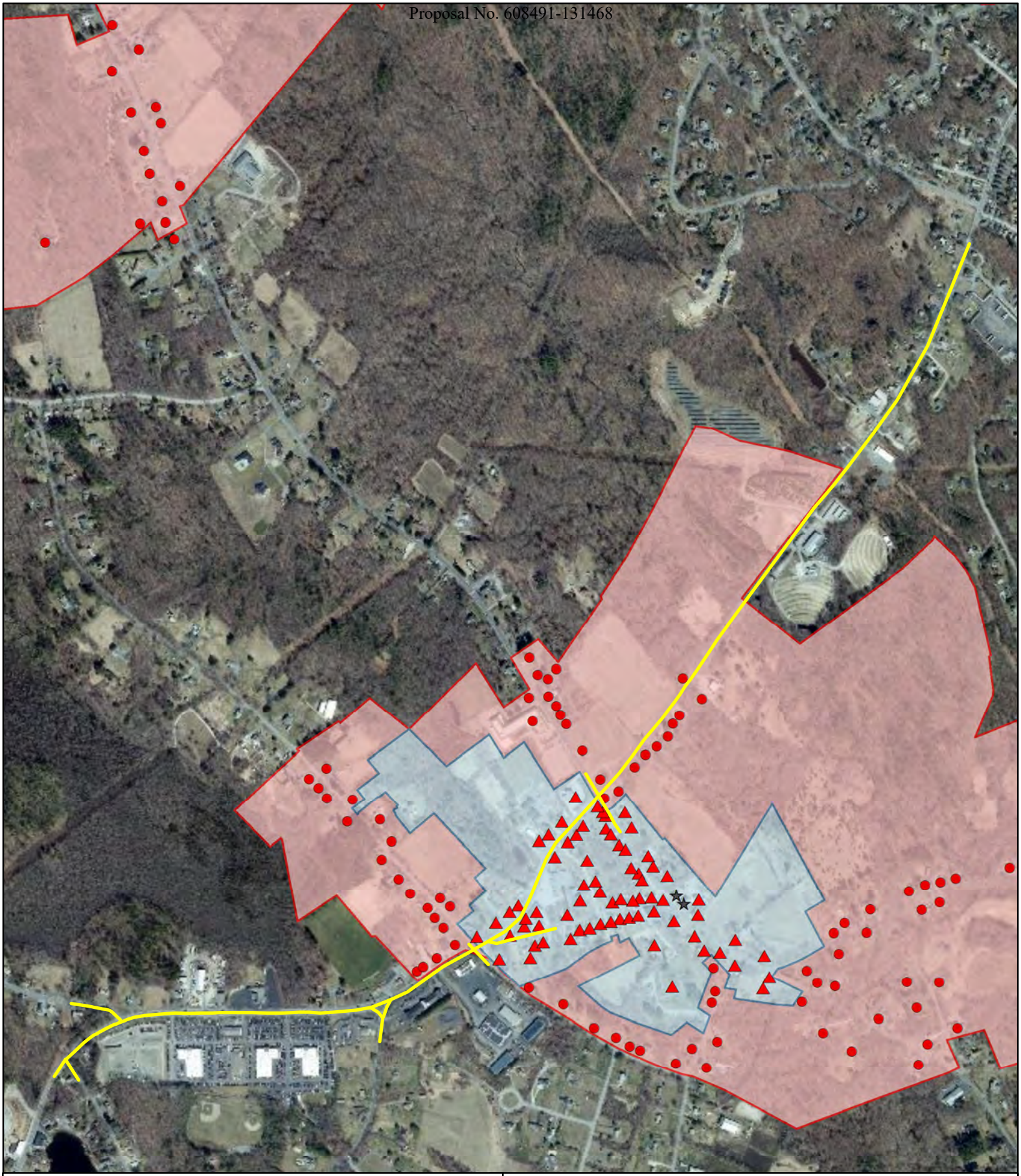
Boston, MA | November 2022

Legend

- Project Corridor
- Municipal
- Land Trust
- Private
- Town Boundaries

0 0.15 0.3 0.45 0.6 Miles

N



Cultural Resources Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 9

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | November 2022

Appendix B – Wetland Delineation Report, Memorandum, and Affidavit

HNTB Corporation
The HNTB Companies
Engineers Architects Planners

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Wetland Delineation Affidavit

Resurfacing and Related Work on Route 16 (Uxbridge Road)
Mendon, Massachusetts

1. Introduction

This affidavit is being provided to support a Notice of Intent (NOI) and a Section 404 Pre-Construction Notification (PCN) under General Permit (GP) #23 – Linear Transportation Projects and Wetland/Stream Crossings for work associated with pavement repair and resurfacing, bicycle and pedestrian accommodations including a shared-use path, and reconstruction of five (5) signalized intersections along Route 16 (Site) in Mendon, Massachusetts (Project).

Wetland resources within the vicinity of the Site were originally delineated by HNTB in accordance with the Massachusetts Department of Environmental Protection (MassDEP) and the U.S. Army Corps of Engineers (USACE) and the 2012 Northeast Regional Supplement on August 7th, 11th, and October 1st, 2020. Per 310 CMR 10.05(6)(3) and 33 U.S.C. 1344, a resource area delineation is valid for 3 and 5 years, respectfully. Therefore, the boundaries of resources on or adjacent to the Site were verified for accuracy on October 4th, 2023. Changes to the resource area boundaries identified during the field verification are summarized below.

2. Summary of Changes to Resource Area Boundaries

HNTB-A

No changes. The wetland boundary is greater than 100 feet from the edge of any proposed work, and no impacts to jurisdictional areas are proposed. Therefore, HNTB-A was not re-flagged.

HNTB-B

No changes. The wetland boundary is greater than 100 feet from the edge of any proposed work, and no impacts to jurisdictional areas are proposed. Therefore, HNTB-B was not re-flagged.

HNTB-C

Partial changes to the boundary of HNTB-C have been made. Upon review of the originally hung flags HNTB-C-1 through HNTB-C-4, this area no longer met the definition of a jurisdictional wetland. Vegetation observed within the previously delineated wetland included bracken fern (FACU), poison ivy (FAC), American burnweed (UPL), red maple (FAC), and Canadian goldenrod (FACU) as shown in Photo 1 below. No indicators of hydrology were present. Therefore, the delineated wetland boundary was updated as shown in Figure 3C. The revised wetland boundary begins further from the edge of the roadway and continues in a southeasterly direction before shifting west toward Muddy Brook. The revised wetland

boundary meets Muddy Brook at previously hung flag #HNTB-C-9. The GPS locations of previously hung flags HNTB-C-5 through HNTB-C-8 were also updated, as it appears that at the time of the original delineation, the GPS may have captured the location of the previously hung flags incorrectly.



Photo 1. Photo of area previously delineated as a portion of HNTB-C taken at flag HNTB-C-2. This area does not meet the definition of a jurisdictional wetland.

HNTB-E

No changes. HNTB was able to verify that the previously delineated boundary line remains accurate. In areas where previously hung flags were no longer visible or were unable to be located in the field, HNTB re-hung pink flagging at the GPS points where the previous flag had been hung.

HNTB-F

Partial changes to the boundary of HNTB-F have been made. Upon review of the area, the southern portion of HNTB-F has been extended to include the addition of a small scrub-shrub wetland area. Vegetation observed within this area included purple-stem aster (OBL), creeping jenny (FACW), sweet pepperbush (FAC), and late goldenrod (FACW). Several primary indicators of hydrology were present, including surface water, a high water table, and saturation, as shown in Photo 2 below, as well as an observed hydrogen sulfide odor. The revised wetland boundary continues north before tying into the previously delineated HNTB-F at flag #HNTB-F-8. The GPS locations of previously hung flags HNTB-F-1 through HNTB-F-6 were also updated, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly.





Photo 2 (left). Visible soil saturation at surface, indicative of a high water table.

Photo 3 (right). View of scrub-shrub wetland area not identified during original delineation. Note the abundance of purple-stem aster in red, an obligate wetland species.

HNTB-G

Partial changes to the boundary of HNTB-G have been made, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly. HNTB did not change the physical locations of any wetland flags; rather, the locations of the previously hung flags were updated using a GPS with sub-meter accuracy.

HNTB-H

No changes. HNTB was able to verify that the previously delineated boundary remains accurate. In areas where previously hung flags were no longer visible or were unable to be located in the field, HNTB re-hung pink flagging at the GPS points where the previous flags had been hung.

HNTB-I

No changes. HNTB was able to verify that the previously delineated boundary remains accurate. In areas where previously hung flags were no longer visible or were unable to be located in the field, HNTB re-hung pink flagging at the GPS points where the previous flag had been hung.

HNTB-J

No changes. The wetland boundary is greater than 100 feet from the edge of any proposed work, and no impacts to jurisdictional areas are proposed. Therefore, HNTB-J was not re-flagged.

Muddy Brook

Partial changes to the boundary of the Bank were made, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly. HNTB did

not change the physical locations of any Bank flags; rather, the locations of the previously hung flags were updated using a GPS with sub-meter accuracy.

Willow Brook

Partial changes to the boundary of the Bank were made, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly. HNTB did not change the physical locations of any Bank flags; rather, the locations of the previously hung flags were updated using a GPS with sub-meter accuracy.

Unnamed Stream Adjacent to HNTB-G

Partial changes to the boundary of the Bank were made, as it appears that at the time of the original delineation, the GPS may have captured the locations of the previously hung flags incorrectly. HNTB did not change the physical locations of any Bank flags; rather, the locations of the previously hung flags were updated using a GPS with sub-meter accuracy.

3. Conclusion

Based on a field review of the Site, I certify under pains and penalties of perjury that the resource boundaries are accurately depicted on the updated wetland delineation maps dated October 5th, 2023 and the Environmental Site Plans submitted with the Notice of Intent and Section 404 Self-Verification Notification Form.

Jessica Marino, PWS Digitally signed by Jessica Marino, PWS DN: C=US, E=jemarino@hntb.com, O=HNTB, CN="Jessica Marino, PWS" Date: 2024.02.14 14:53:48-05'00'

Jessica Marino, PWS
Professional Wetland Scientist

October 5, 2023
Date

Attachments

- Updated Wetland Delineation Maps



Updated Delineation Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 3A

HNTB

massDOT
Massachusetts Department of Transportation
Highway Division

Boston, MA | October 2023

Legend

- Project Corridor
- Updated BVW Boundary
- Updated Bank Boundary
- Previously Delineated BVW Boundary
- Previously Delineated Bank Boundary

0 50 100 150 Feet

N



Updated Delineation Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 3B

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | October 2023

Legend

- Project Corridor
- Updated BVW Boundary
- Updated Bank Boundary
- Previously Delineated BVW Boundary
- Previously Delineated Bank Boundary

0 40 80 120 Feet

N



Updated Delineation Map
Resurfacing and Related Work on Route 16
Mendon, MA

Figure 3C

HNTB

massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | October 2023

Legend

- Project Corridor
- Updated BVW Boundary
- Updated Bank Boundary
- Previously Delineated BVW Boundary
- Previously Delineated Bank Boundary

0 90 180 270 Feet

N

WETLAND DELINEATION REPORT

ROUTE 16 RESURFACING AND RELATED WORK

MENDON, MA

Prepared for:



Massachusetts Department of Transportation
Highway Division
10 Park Plaza
Boston, MA 02116

Submitted by:



HNTB Corporation
31 St. James Avenue
Boston, MA 02116

NOVEMBER 2020

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Appendix B – Field Data Forms and Photographs

1. INTRODUCTION

The Massachusetts Department of Transportation – Highway Division (MassDOT) is proposing roadway resurfacing and sidewalk rehabilitation to Route 16 in Mendon, MA (Project No. 608491). Route 16 will be resurfaced from just west of Taft Avenue to the Hopedale town line and upgrades will be made to the existing sidewalk on the north side of the roadway from Hartford Avenue West to North Avenue. A shared use path will be installed on the south side of the roadway for the entire length of the project. The project also includes safety improvements at the intersections, two new traffic signals at Hartford Avenue West and Maple Street, and a signal upgrade at North Avenue. The goal of the project is to improve pavement conditions and meet the goals of MassDOT's Healthy Transportation Policy.

HNTB Corporation performed a field delineation along the Route 16 corridor to identify wetlands and waterbodies that meet the criteria for federal or state regulation under Section 404 of the Clean Water Act (CWA) and/or the Massachusetts Wetlands Protection Act (MA WPA). Results will be used to facilitate environmental permitting, and construction planning and design efforts. Based on the proposed design, the wetland delineation effort was limited to evaluating wetlands within 200 feet of the existing roadway centerline.

Supplemental information supporting the wetlands and waters delineation is included in **Appendices A and B**, as follows:

Appendix A: Figures
Appendix B: Field Data Forms (Including Photographs)

2. BACKGROUND INFORMATION

Prior to the field investigation, HNTB wetland scientists conducted a desktop review of existing site information to aid in the identification of potential resources in the project area. Resources reviewed included:

- United States Geologic Survey (USGS) Topographic Quadrangle 7.5' series for Blackstone, MA, RI
- United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) GIS data
- The United States Department of Agriculture, Natural Resource Conservation Service (USDA-NRCS) *Web Soil Survey (WSS) for Worcester County, Massachusetts*
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM)

Results of the desktop review are described below:

Mapped NWI Wetlands and USGS Streams

USGS identified one intermittent stream (Willow Brook) and one perennial stream (Muddy Brook) intersecting the project area. Within 200 feet of the project area, NWI identified one palustrine forested wetland along Muddy Brook, south of Route 16; one palustrine emergent wetland along Willow Brook,

north of Route 16; and a palustrine forested wetland east of New England Steak and Seafood. All mapped NWI and USGS (25K) features are presented in **Appendix A, Figure 2**.

Soils

The USDA-NRCS WSS for Worcester County identified 11 mapped soil units within the project area as shown in **Table 1** and **Appendix A, Figure 3**. One hydric soil and two predominantly hydric soils were identified within the project area. Hydric soils can be indicative of the presence of wetland communities. No highly erodible soils were identified within the project area.

Table 1. Mapped Soils

Map Unit Symbol	Map Unit Name	K Factor*	Hydric Rating**	Drainage Class
3A	Scarboro and Walpole soils, 0 to 3 percent slopes	--	100	Very Poorly Drained
72A	Whitman fine sandy loam, 0 to 3 percent slopes	--	99	Very Poorly Drained
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	--	99	Very Poorly Drained
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	--	1	Well Drained
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	0.28	0	Somewhat Excessively Drained
315A	Scituate fine sandy loam, 0 to 3 percent slopes	0.20	10	Moderately Well Drained
315B	Scituate fine sandy loam, 3 to 8 percent slopes	0.20	5	Moderately Well Drained
420B	Canton fine sandy loam, 3 to 8 percent slopes	0.24	1	Well Drained
420C	Canton fine sandy loam, 8 to 15 percent slopes	0.24	0	Well Drained
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	--	4	Well Drained
651	Udorthents, smoothed	--	0	--

**Erodibility Coefficient – Value assigned to soil types by NRCS. K > 0.35 are considered to be highly erodible soils*

***Hydric Rating – Value is based on the percentage of hydric soils within the soil type. Non-hydric soils have a value of 0, predominantly non-hydric soils have a value between 0 and 33, partially hydric soils have a value between 33 and 66, predominantly hydric soils have a value between 66 and 99, and hydric soils have a value of 100.*

FEMA Floodplain

The FEMA 100-year floodplain associated with Muddy Brook comes within approximately 10 feet of

Route 16 to the south and approximately 50 feet of Route 16 to the north. Muddy Brook's regulatory floodway intersects the project area on the south side of Route 16. The 500-year floodplain in this area is contained within the culvert under Route 16. (**Appendix A, Figure 2**).

3. METHODS

Wetland scientists from HNTB performed a systematic field survey within the project limits on August 7, August 11, and October 1, 2020 to evaluate and delineate areas meeting wetland criteria. Wetland and non-wetland areas were initially identified based on representative plant communities and obvious hydrologic and topographic indicators. The delineation then involved the characterization of vegetation, soils, and hydrology, and pertinent observations on the three criteria were recorded on Wetland Determination Data Forms. Each delineated feature was given a unique identifier and photographed. Boundary points were identified for each feature, marked with survey flagging, and numbered consecutively. Boundary point positions were located using handheld GPS units and subsequently ground surveyed by Nitsch Engineering.

The wetland delineation was conducted in accordance with the methods described in the *U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual (1987 edition),* and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region dated January 2012*. Per the USACE 1987 manual, routine wetland determination methods with onsite inspection were used to determine the presence of wetlands in the project area.

4. FIELD INVESTIGATION RESULTS

As shown on **Figures 4A - 4E** in **Appendix A** and on the 25% Design Plans, ten wetlands and two streams were identified in the project area. Descriptions of the wetland areas, including information on vegetation, soils, and hydrologic conditions are provided below. Field Data Forms and Photographs for each feature are included in **Appendix B**.

Wetland HNTB-A (Flag # HNTB-A-1 – HNTB-A-5)

Wetland HNTB-A is located north of Route 16, west of 50 Milford Street. Wetland HNTB-A is designated as a palustrine scrub-shrub/emergent (PSS1/EM1E) wetland on NWI mapping and is dominated by red maple (*Acer rubrum*), red oak (*Quercus rubra*), sweet pepperbush (*Clethra alnifolia*), sensitive fern (*Onoclea sensibilis),* and royal fern (*Osmunda regalis*). Wetland hydrology indicators include saturation (A3) and water-stained leaves (B9). The hydric soil indicator for Wetland HNTB-A is histosol (A1). Wetland HNTB-A meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-B (Flag # HNTB-B-1 – HNTB-B-7)

Wetland HNTB-B is a manmade basin located north of Route 16, adjacent to HNTB-A. Wetland HNTB-B is designated as a palustrine scrub-shrub/emergent (PSS1/EM1E) wetland on NWI mapping and is dominated by phragmites (*Phragmites australis*) and soft rush (*Juncus effusus*). The wetland hydrology indicator for Wetland HNTB-B is water-stained leaves (B9) and the hydric soil indicators are sandy

redox (S5) and depleted matrix (F3). Wetland HNTB-B meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-C (Flag # HNTB-C-1 – HNTB-C-9)

Wetland HNTB-C is located north of Route 16, abutting Muddy Brook. This feature is not shown on NWI mapping. Wetland HNTB-C is dominated by red maple, gray birch (*Betula populifolia),* southern arrowwood (*Viburnum dentatum*), sensitive fern, skunk cabbage (*Symplocarpus foetidus*), poison ivy (*Toxicodendron radicans*), and Virginia creeper (*Parthenocissus quinquefolia*). Wetland hydrology indicators include drift deposits (B3) and water-stained leaves (B9). The hydric soil indicator for Wetland HNTB-C is sandy redox (S5). Wetland HNTB-C meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-D (Flag # HNTB-D-1 – HNTB-D-9)

Refer to description of HNTB-C above. Wetland HNTB-D also includes an intermittent stream that flows into Muddy Brook.

Wetland HNTB-E (Flag # HNTB-E-1 – HNTB-E-12)

Wetland HNTB-E is located south of Route 16, abutting Muddy Brook. Wetland HNTB-E is designated as a palustrine forested (PFO1E) wetland on NWI mapping and is dominated by red maple, speckled alder (*Alnus incana*), sensitive fern, giant goldenrod (*Solidago gigantea*), skunk cabbage, and jewelweed (*Impatiens capensis*). Wetland hydrology indicators include saturation (A3), water-stained leaves (B9), and geomorphic position (D2). The hydric soil indicator for Wetland HNTB-E is histosol (A1). Wetland HNTB-E meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-F (Flag # HNTB-F-1 – HNTB-F-10)

Wetland HNTB-F is located north of Route 16, abutting Willow Brook. Wetland HNTB-F is designated as a palustrine emergent (PEM1E) wetland on NWI mapping and is dominated by speckled alder, broadleaf cattail (*Typha latifolia*), and jewelweed. Wetland hydrology indicators include saturation (A3) and geomorphic position (D2). The hydric soil indicator for Wetland HNTB-E is histic epipedon (A2). Wetland HNTB-F meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-G (Flag # HNTB-G-1 – HNTB-G-10)

Wetland HNTB-G is located north of Route 16, east of New England Steak and Seafood. Wetland HNTB-G is designated as a palustrine forested (PFO1E) wetland on NWI mapping and is dominated by red maple, quaking aspen (*Populus tremuloides*), speckled alder, skunk cabbage, and sensitive fern. Wetland hydrology indicators include surface water (A1), high water table (A2), and saturation (A3). HNTB-G includes a channel with standing water. The hydric soil indicator for Wetland HNTB-G is depleted matrix (F3). Wetland HNTB-G meets all three wetland parameters and is considered a

jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-H (Flag # HNTB-H-1 – HNTB-H-16)

Wetland HNTB-H is located south of Route 16, west of Taft Avenue, and is connected to Wetland HNTB-I via a culvert under Route 16. This feature is not shown on NWI mapping. Wetland HNTB-H is dominated by red maple, sweet pepperbush, southern arrowwood, winterberry (*Ilex verticillata*), reed canary grass (*Phalaris arundinacea*), and poison ivy. Wetland hydrology indicators include high water table (A2), saturation (A3), inundation visible on aerial imagery (B7), water-stained leaves (B9), drainage patterns (B10), aquatic fauna (B13), and geomorphic position (D2). Wetland HNTB-H includes three culverts, one of which is incised with standing water at the opening. Wetland HNTB-H includes a small drainage channel located between flags H-9 and H-10. The hydric soil indicator for Wetland HNTB-H is depleted dark surface (F7). Wetland HNTB-H meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Wetland HNTB-I (Flag # HNTB-I-1 – HNTB-I-12)

Wetland HNTB-I is located north of Route 16, west of Taft Avenue and is connected to Wetland HNTB-H via a culvert under Route 16. See Wetland HNTB-H description above for description of Wetland HNTB-I.

Wetland HNTB-J (Flag # HNTB-J-1 – HNTB-J-11)

Wetland HNTB-J is located north of Route 16, east of HNTB-I. This feature is not shown on NWI mapping. Wetland HNTB-J is dominated by red maple, black cherry (*Prunus serotina*), winterberry, ostrich fern (*Matteuccia struthiopteris*), jewelweed, Virginia creeper, and greenbrier (*Smilax rotundifolia*). Wetland hydrology indicators include saturation (A3), geomorphic position (D2), and microtopographic relief (D4). The hydric soil indicator for Wetland HNTB-J is depleted matrix (F3). Wetland HNTB-J meets all three wetland parameters and is considered a jurisdictional feature by USACE and is regulated as a Bordering Vegetated Wetland (BVW) by MassDEP.

Muddy Brook (Flag # HNTB-Bank-1–9 & HNTB-Bank-1–11)

Muddy Brook is a perennial stream located west of Mendon Drive-In that flows east through a culvert under Route 16 and abuts Wetlands HNTB-C, HNTB-D, and HNTB-E. This feature has a natural channel shape with moderately eroded banks and 2:1 and 3:1 side slopes. The channel is approximately 10 to 15 feet wide and 0 to 12 inches deep. The substrate of Muddy Brook includes cobble, sand, and gravel. Indicators of ordinary high water (OHW) include a clear, natural line impressed on the bank, shelving, sediment deposition, presence of flood/litter debris, sediment sorting, scour, and observed flow. The right and left banks consist of forested wetland. Muddy Brook is a tributary to a navigable water and meets the requirements of a jurisdictional feature under the CWA. Under the MA WPA, Muddy Brook is jurisdictional as Bank, Land Under Water, and includes 200-foot Riverfront Area starting at the mean annual high water line.

Willow Brook (Flag # HNTB-Bank-1 – HNTB-Bank-10)

Willow Brook is an intermittent stream located east of Washington Street that flows east through a culvert under Route 16 and abuts Wetlands HNTB-F. This feature includes a weir structure approximately 15 feet from the culvert opening west of Route 16, and stone wall banks between Route 16 and Maple Street. Willow Brook has moderately stable banks and 2:1 and 3:1 side slopes. The channel is approximately 8 feet wide and 0 to 12 inches deep. The substrate of Willow Brook includes sand, gravel, and muck. Indicators of ordinary high water (OHW) include a clear, natural line impressed on the bank, shelving, sediment deposition, water staining, scour, and observed flow. The right and left banks consist of forested wetland and upland areas. Willow Brook is a tributary to a navigable water and meets the requirements of a jurisdictional feature under the CWA. Under the MA WPA, Willow Brook is jurisdictional as Bank.

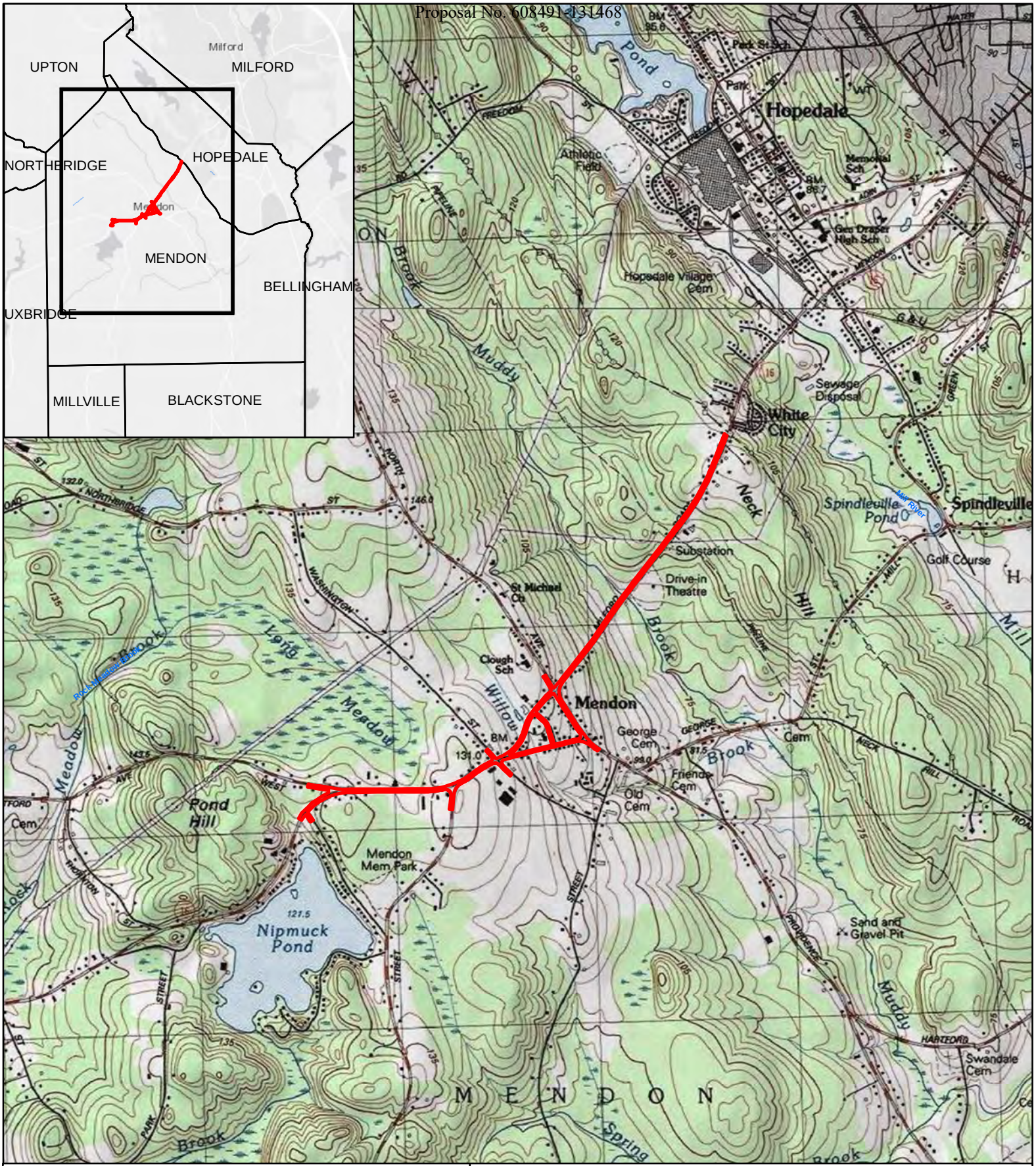
Table 1: Wetland Areas Summary

Wetland	NWI Class.	Dominant Plant Species	Hydrology Indicators	Hydric Soil Indicator	USACE Jurisdictional?	MA WPA Regulated Features
HNTB-A	PSS1/EM1E	*-Acer rubrum* *-Quercus rubra* *-Clethra alnifolia* *-Onoclea sensibilis* *-Osmunda regalis*	-Saturation (A3) -Water stained leaves (B9)	Histosol (A1)	Yes	BVW
HNTB-B	PSS1/EM1E	*-Phragmites australis* *-Juncus effusus*	-Water stained leaves (B9)	-Sandy redox (S5) -Depleted matrix (F3)	Yes	BVW
HNTB-C	PFO	*-Acer rubrum* *-Betula populifolia* *-Viburnum dentatum* *-Onoclea sensibilis* *-Symplocarpus foetidus* *-Toxicodendron radicans* *-Parthenocissus quinquefolia*	-Drift deposits (B3) -Water stained leaves (B9)	Sandy redox (S5)	Yes	BVW
HNTB-D	PFO	*-Acer rubrum* *-Betula populifolia* *-Viburnum dentatum* *-Onoclea sensibilis* *-Symplocarpus foetidus* *-Toxicodendron radicans* *-Parthenocissus quinquefolia*	-Drift deposits (B3) -Water stained leaves (B9)	Sandy redox (S5)	Yes	BVW
HNTB-E	PFO1E	*-Acer rubrum* *-Alnus incana* *-Onoclea sensibilis* *-Solidago gigantea* *-Symplocarpus foetidus* *-Impatiens capensis*	-Saturation (A3) -Water stained leaves (B9) -Geomorphic position (D2)	Histosol (A1)	Yes	BVW

Table 1: Wetland Areas Summary						
Wetland	NWI Class.	Dominant Plant Species	Hydrology Indicators	Hydric Soil Indicator	USACE Jurisdictional?	MA WPA Regulated Features
HNTB-F	PEM1E	*-Alnus incana* *-Typha latifolia* *-Impatiens capensis*	-Saturation (A3) -Geomorphic position (D2)	Histic Epipedon (A2)	Yes	BVW
HNTB-G	PFO1E	*-Acer rubrum* *-Populus tremuloides,* *-Alnus incana* *-Onoclea sensibilis* *-Symplocarpus foetidus*	-Surface water (A1) -High water table (A2) -Saturation (A3)	Depleted Matrix (F3)	Yes	BVW
HNTB-H	PEM/PFO	*-Acer rubrum* *-Clethra alnifolia* *-Viburnum dentatum* *-Ilex verticillata* *-Phalaris arundinacea* *-Toxicodendron radicans*	-High water table (A2) -Saturation (A3) -Inundation visible on aerial (B7) -Water stained leaves (B9) -Drainage patterns (B10) -Geomorphic position (D2)	Depleted Dark Surface (F7)	Yes	BVW
HNTB-I	PEM/PFO	*-Acer rubrum* *-Clethra alnifolia* *-Viburnum dentatum* *-Ilex verticillata* *-Phalaris arundinacea* *-Toxicodendron radicans*	-High water table (A2) -Saturation (A3) -Inundation visible on aerial (B7) -Water stained leaves (B9) -Drainage patterns (B10) -Geomorphic position (D2)	Depleted Dark Surface (F7)	Yes	BVW
HNTB-J	PFO	*-Acer rubrum* *-Prunus serotina* *-Ilex verticillata* *-Matteuccia struthiopteris* *-Impatiens capensis* *-Parthenocissus quinquefolia* *-Smilax rotundifolia*	-Saturation (A3) -Geomorphic position (D2) -Microtopographic Relief (D4)	Depleted Matrix (F3)	Yes	BVW
Muddy Brook	Perennial	N/A	N/A	N/A	Yes	Bank, LUW, RA
Willow Brook	Intermittent	N/A	N/A	N/A	Yes	Bank

APPENDIX A

FIGURES



Project Location Map

Route 16 Resurfacing and Related Work

Legend

Project Boundary

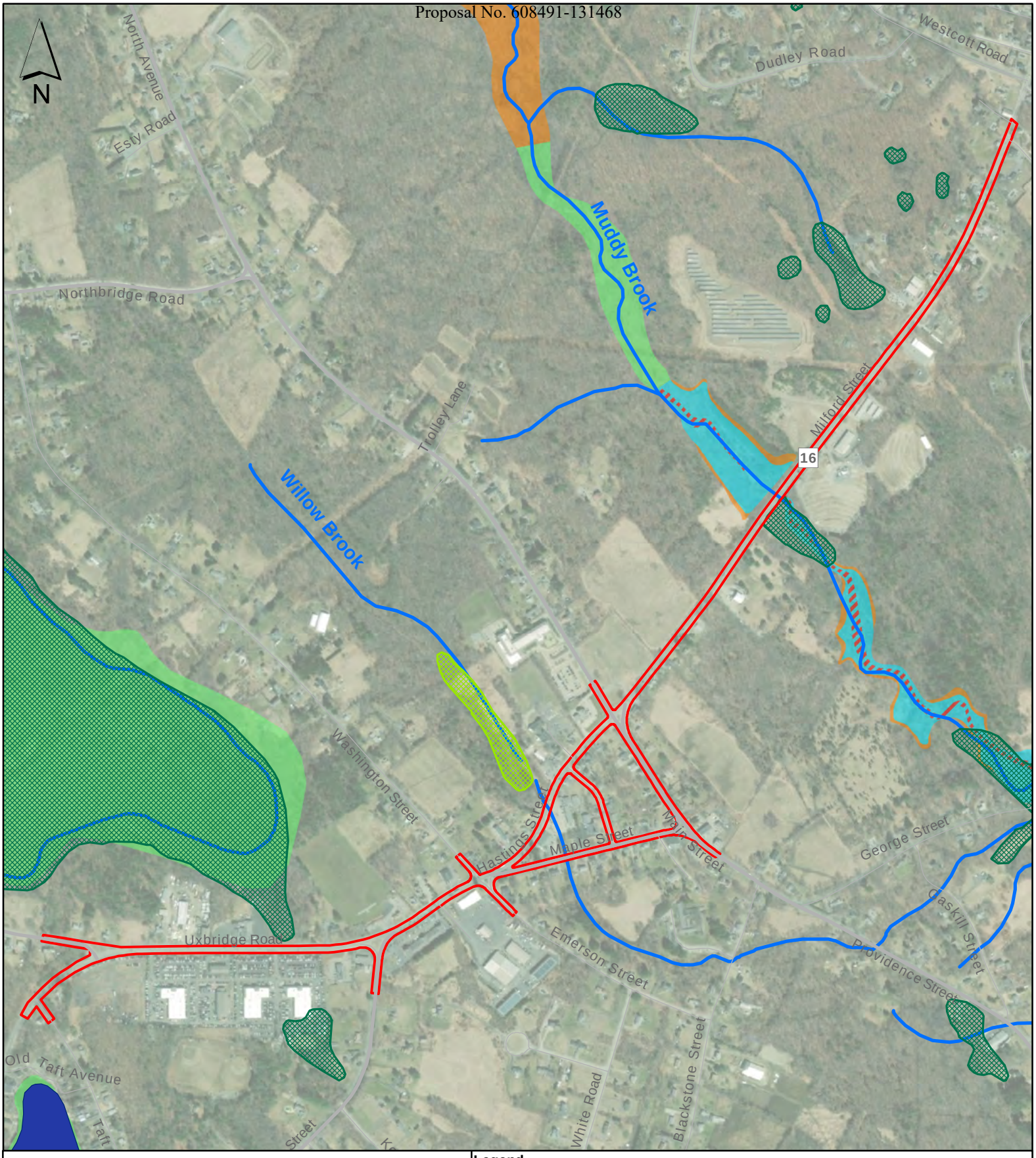
Figure 1

HNTB massDOT

Mendon, MA | September 2020

Note:
- Basemap obtained from ESRI.

0 2,000 4,000 Feet



Natural Resources Map

Route 16 Resurfacing and Related Work

Figure 2

HNTB massDOT

Mendon, MA | September 2020

Legend

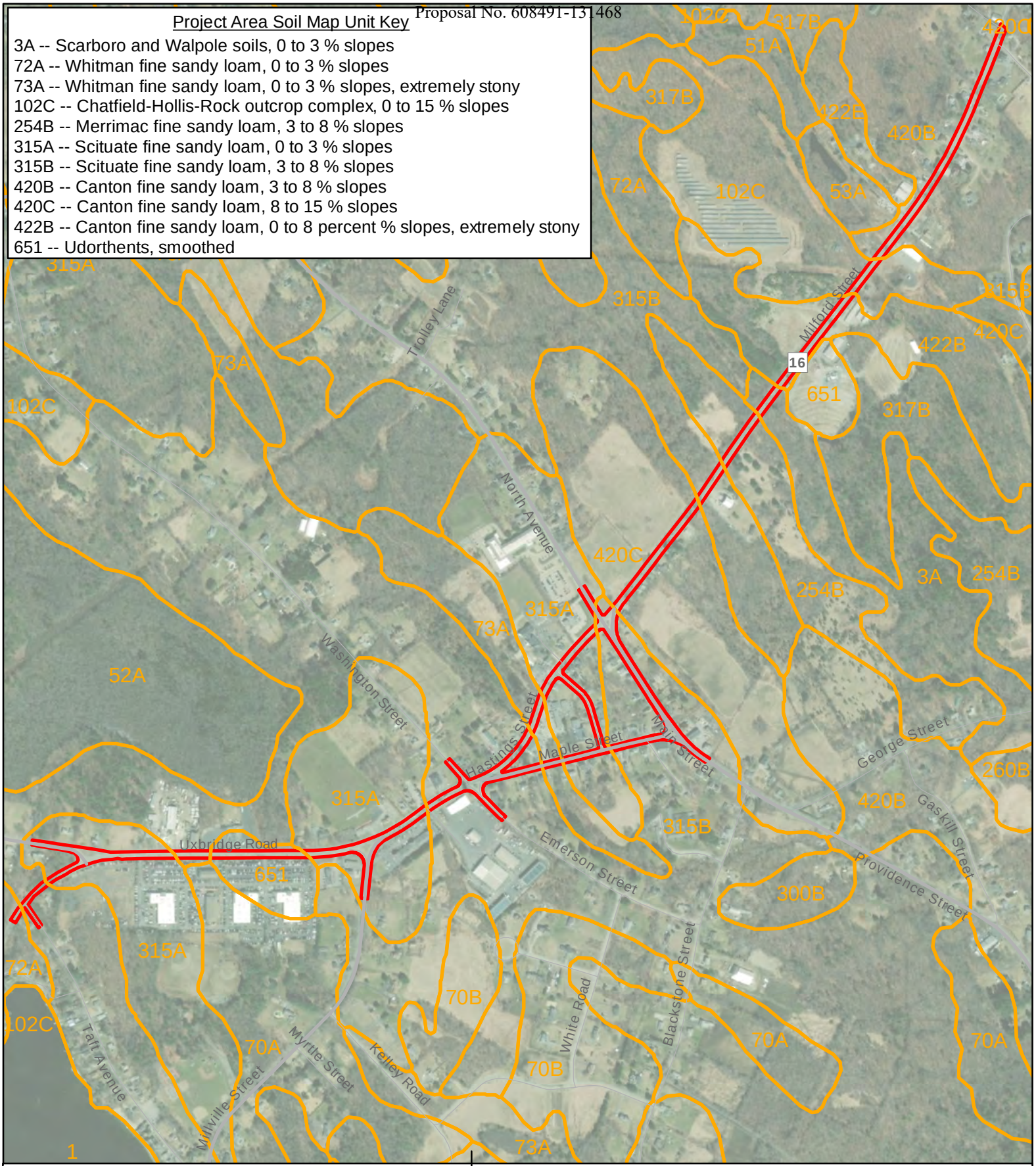
- Project Boundary
- NWI Freshwater Emerg. Wet.
- NWI Freshwater Forest/Shrub Wet.
- Freshwater Pond
- NWI Lake
- USGS 25K Streams

FEMA Flood Zones

- A: 1% Annual Chance of Flood, no BFE
- AE: 1% Annual Chance of Flood, with BFE
- AE: Regulatory Floodway
- X: 0.2% Annual Chance of Flood

Note:
- Basemap obtained from ESRI.

0 1,000 2,000 Feet



USDA NRCS Soils Map

Route 16 Resurfacing and Related Work

Legend

- USDA NRCS Soil Boundary
- Project Boundary

N

Figure 3

HNTB massDOT

Mendon, MA | September 2020

Note:
- Basemap obtained from ESRI.

0 1,000 2,000 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Figure 4A

HNTB massDOT

Mendon, MA | September 2020

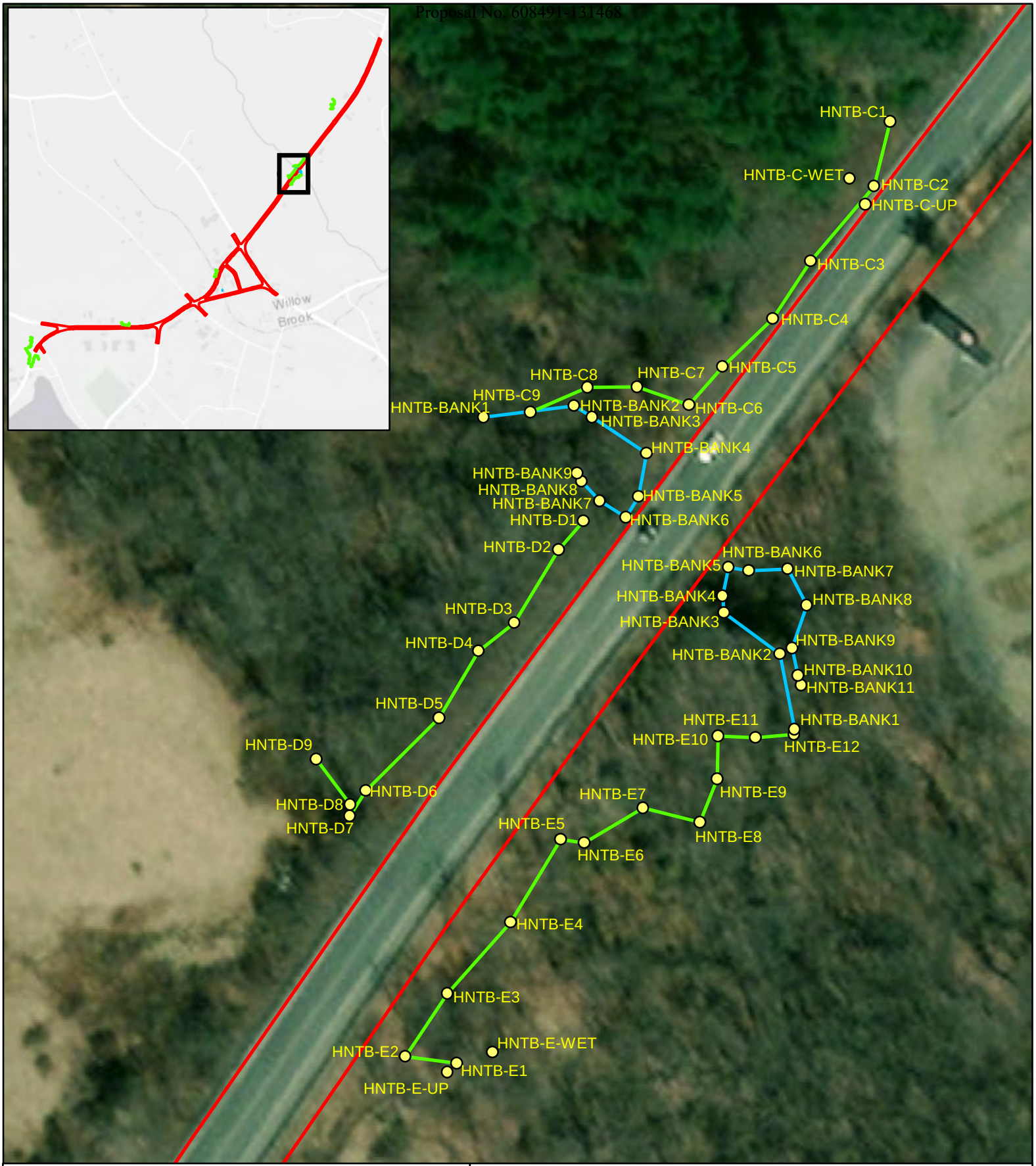
Legend

- Wetland Flags
- Wetland Boundary
- Project Boundary

N

Note:
- Basemap obtained from ESRI.

0 75 150 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Figure 4B

HNTB massDOT

Mendon, MA | September 2020

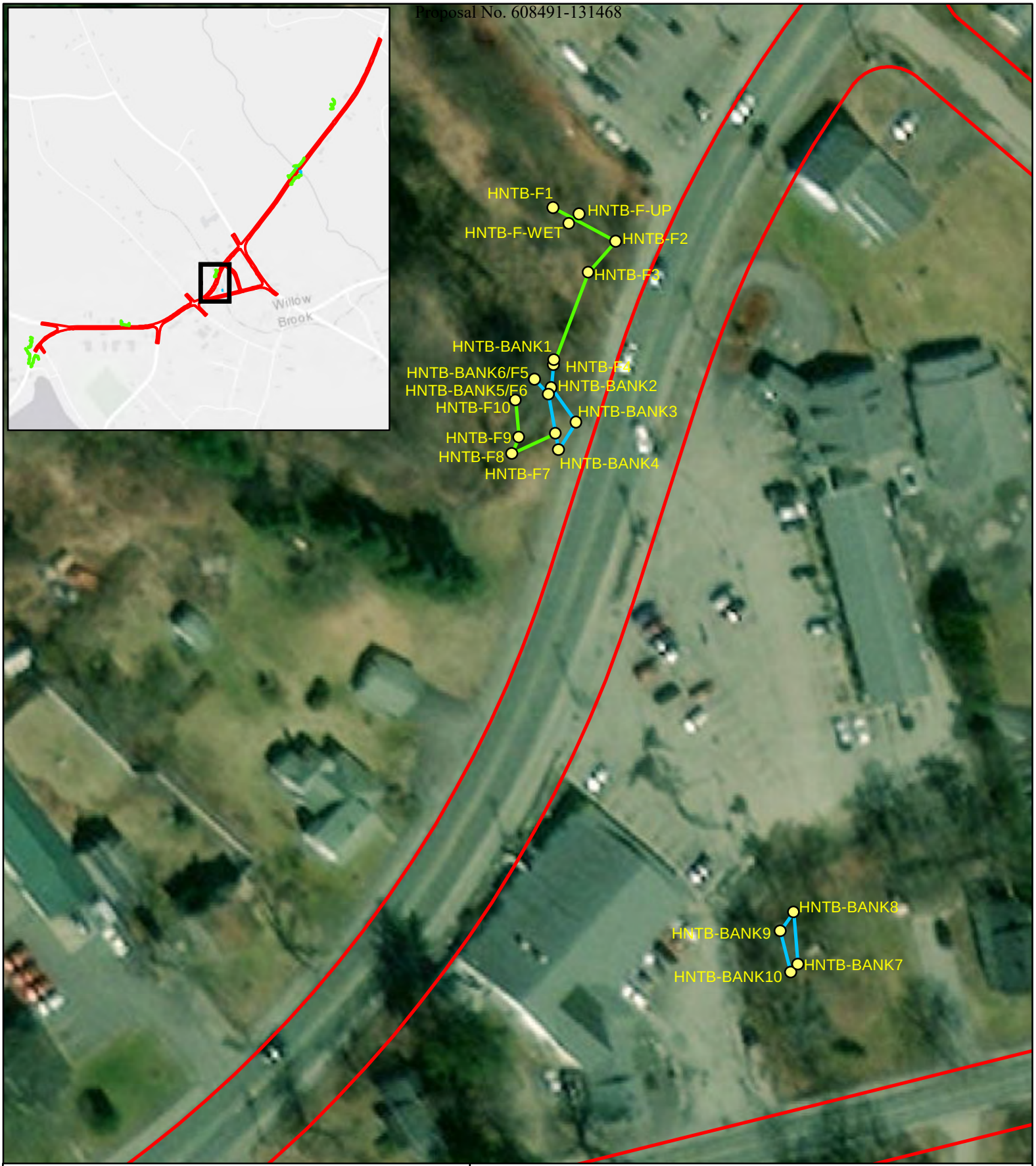
Legend

- Wetland Flags
- Wetland Boundary
- Bank Boundary
- Project Boundary

N

Note:
- Basemap obtained from ESRI.

0 75 150 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Figure 4C

HNTB massDOT

Mendon, MA | September 2020

Legend

- Wetland Flags
- Wetland Boundary
- Bank Boundary
- Project Boundary

N

Note:
- Basemap obtained from ESRI.

0 75 150 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Figure 4D

HNTB massDOT

Mendon, MA | September 2020

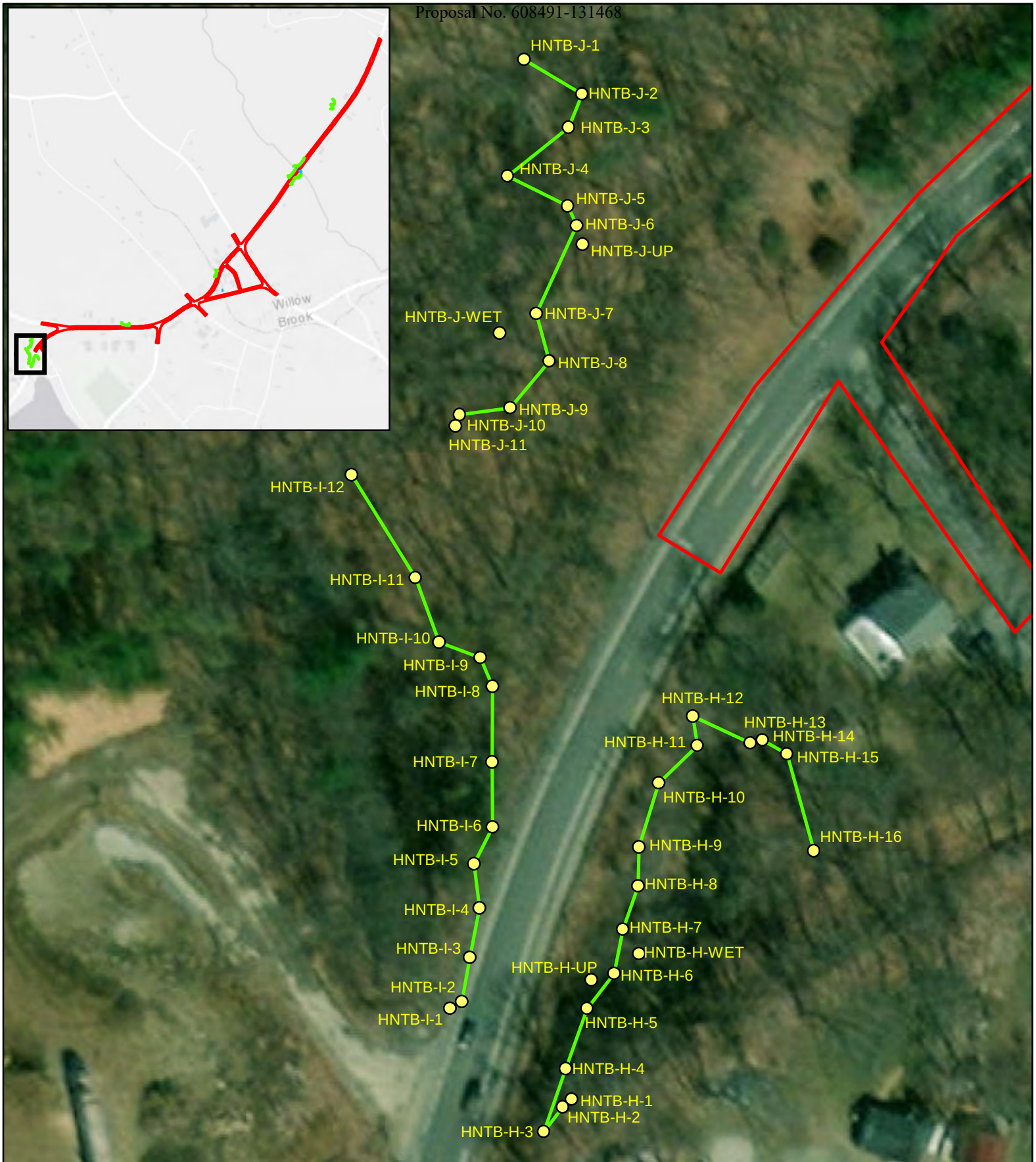
Legend

- Wetland Flags
- Wetland Boundary
- Bank Boundary
- Project Boundary

N

Note:
- Basemap obtained from ESRI.

0 75 150 Feet



Wetland Delineation Map

Route 16 Resurfacing and Related Work

Legend

- Wetland Flags
- Wetland Boundary
- Project Boundary

N

Figure 4E

HNTB massDOT

Mendon, MA | September 2020

Note:
- Basemap obtained from ESRI.

0 75 150 Feet

APPENDIX B

FIELD DATA FORMS AND PHOTOGRAPHS

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-A WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range: Flag #s: HNTB-A-1 - HNTB-A-5

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.115453 Long: -71.546759 Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: PSS1/EM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-A WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	80	Yes	FAC
2. Quercus alba	40	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	120	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Clethra alnifolia	40	Yes	FAC
2. Ligustrum vulgare	3	No	FACU
3.			
4.			
5.			
6.			
7.			
	43	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Onoclea sensibilis	40	Yes	FACW
2. Osmunda regalis	25	Yes	OBL
3. Toxicodendron radicans	10	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-A WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-20"	10YR 2/1	100					Oa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☑ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-A Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Slope Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.115400 Long: -71.546992 Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-A Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus alba	60	Yes	FACU
2. Acer rubrum	40	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	100	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Hamamelis virginiana	60	Yes	FACU
2. Clethra alnifolia	40	Yes	FAC
3. Quercus alba	10	No	FACU
4.			
5.			
6.			
7.			
	110	= Total Cover	
Herb Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	0	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	80	x 3 =	240
FACU species	130	x 4 =	520
UPL species	0	x 5 =	0
Column Totals:	210 (A)		760 (B)

Prevalence Index = B/A = 3.6

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-A Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3"	10YR 3/3	100					LS	
3-16"	10YR 6/4	100					LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-B WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range: Flag #s: HNTB-B-1 - HNTB-B-7

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.115680 Long: -71.546859 Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: PSS1/EM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Manmade basin

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-B WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Phragmites australis	80	Yes	FACW
2. Juncus effusus	25	Yes	OBL
3. Lythrum salicaria	15	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	120 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-B WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 5/1	80	10YR 4/4	20			LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☑ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-B Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Convex Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.115661 Long: -71.546865 Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-B Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Solidago canadensis	80	Yes	FACU
2. Ambrosia artemisiifolia	20	No	FACU
3. Daucus carota	15	No	UPL
4. Conyza canadensis	10	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	125 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	110	x 4 =	440
UPL species	15	x 5 =	75
Column Totals:	125 (A)		515 (B)

Prevalence Index = B/A = 4.12

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-B Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4"	10YR 4/4	100					LS	Fill
4-12"	10YR 5/3	100					LS	Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-C&D WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.112577 Long: -71.548987 Datum: NAD83

Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: Not shown on NWI

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

HNTB-D same as HNTB-C. Datapoint within HNTB-C, but also representative of HNTB-D.

Flag #s:
HNTB-C-1 - HNTB-C-9
HNTB-D-1 - HNTB-D-9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☑ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-C&D WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	70	Yes	FAC
2. Betula populifolia	20	Yes	FAC
3. Pinus strobus	5	No	FACU
4. Ulmus americana	5	No	FACW
5.			
6.			
7.			
	100	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1. Acer rubrum	50	Yes	FAC
2. Viburnum dentatum	10	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	60	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Onoclea sensibilis	20	Yes	FACW
2. Symplocarpus foetidus	15	Yes	OBL
3. Toxicodendron radicans	15	Yes	FAC
4. Parthenocissus quinquefolia	15	Yes	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	65	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 88% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-C&D WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 2/2	80	10YR 5/6	20	C	M	SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☑ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-C & D Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.112577 Long: -71.548987 Datum: NAD83

Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HNTB-D Up same as HNTB-C Up. Datapoint within HNTB-C Up, but also representative of HNTB-D Up.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-C & D Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus alba	30	Yes	FACU
2. Betula populifolia	20	Yes	FAC
3. Acer rubrum	15	Yes	FACU
4.			
5.			
6.			
7.			
	65	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1. Acer rubrum	40	Yes	FAC
2. Diervilla lonicera	15	Yes	UPL
3. Fraxinus americana	5	No	FACU
4.			
5.			
6.			
7.			
	60	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Vitis labrusca	15	Yes	FACU
2. Pteridium aquilinum	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 29% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	60	x 3 =	180
FACU species	75	x 4 =	300
UPL species	15	x 5 =	75
Column Totals:	150 (A)		555 (B)

Prevalence Index = B/A = 3.7

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-C & D Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16"	10YR 4/4	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-E WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range: Flag #s: HNTB-E-1 - HNTB-E-12

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.111237 Long: -71.549718 Datum: NAD83

Soil Map Unit Name: Merrimac fine sandy loam, 3 to 8 percent slopes NWI classification: PFO1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

Abuts Muddy Brook

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-E WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	30	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Alnus incana	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Onoclea sensibilis	40	Yes	FACW
2. Solidago gigantea	40	Yes	FACW
3. Symplocarpus foetidus	30	Yes	OBL
4. Impatiens capensis	30	Yes	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	150	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-E WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16"	10YR 2/2	100					Oa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☑ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remar



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-E Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.111219 Long: -71.549790 Datum: NAD83

Soil Map Unit Name: Merrimac fine sandy loam, 3 to 8 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-E Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ulmus americana	30	Yes	FACW
2. Catalpa bignonioides	20	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Solidago canadensis	40	Yes	FACU
2. Onoclea sensibilis	30	Yes	FACW
3. Upland grass	25	Yes	UPL
4. Toxicodendron radicans	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1. Rosa multiflora	40	Yes	FACU
2. Celastrus orbiculatus	40	Yes	UPL
3. Parthenocissus quinquefolia	10	No	FACU
4.			
	90	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 29% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	5	x 3 =	15
FACU species	110	x 4 =	440
UPL species	65	x 5 =	325
Column Totals:	240 (A)		900 (B)

Prevalence Index = B/A = 3.75

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-E Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 5/3	100					S	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-F WET

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range: Flag #s: HNTB-F-1 - HNTB-F-10

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.106330 Long: -71.555430 Datum: NAD83

Soil Map Unit Name: Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

Abuts Willow Brook

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-F WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Alnus incana	40	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	40 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Typha latifolia	90	Yes	OBL
2. Impatiens capensis	60	Yes	FACW
3. Solidago gigantea	40	No	FACW
4. Toxicodendron radicans	20	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	210 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-F WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12"	10YR 2/2	100					Oa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☑ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:



Description: View of wetland from wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/7/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-F Up

Investigator(s): M. Turgeon, L. McDonald Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.106376 Long: -71.555372 Datum: NAD83

Soil Map Unit Name: Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	
Wetland Hydrology Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-F Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer platanoides	20	Yes	UPL
2. Catalpa bignonioides	20	Yes	FACU
3. Acer negundo	20	Yes	FAC
4. Fraxinus americana	15	Yes	FACU
5.			
6.			
7.			
	75	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1. Fraxinus americana	5	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	5	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Toxicodendron radicans	50	Yes	FAC
2. Dichanthelium clandestinum	50	Yes	FACW
3. Solidago canadensis	20	No	FACU
4. Sedum acre	20	No	UPL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	140	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1. Celastrus orbiculatus	30	Yes	UPL
2. Toxicodendron radicans	5	No	FAC
3.			
4.			
	35	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 38% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	50	x 2 =	100
FAC species	75	x 3 =	225
FACU species	60	x 4 =	240
UPL species	70	x 5 =	350
Column Totals:	255 (A)		915 (B)

Prevalence Index = B/A = 3.6

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-F Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 5/3	100					SI	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/11/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-G Wet

Investigator(s): M. Turgeon Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Slope Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: -71.562545 Long: 42.103473 Datum: NAD83

Soil Map Unit Name: Scituate fine sandy loam, 3 to 8 percent slopes NWI classification: PFO1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

Standing water in channel

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☑	No ☐	Depth (inches): 5"
Water Table Present?	Yes ☑	No ☐	Depth (inches): 8"
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-G Wet

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum, red maple	60	yes	fac
2.			
3.			
4.			
5.			
6.			
7.			
	60 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Populus tremuloides, quaking aspen	5	yes	facu
2. Alnus incana, speckled alder	15	yes	facw
3.			
4.			
5.			
6.			
7.			
	20 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Symplocarpus foetidus, skunk cabbage	50	yes	obl
2. Onoclea sensibilis, sensitive fern	30	yes	facw
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	50	x 1 =	50
FACW species	45	x 2 =	90
FAC species	60	x 3 =	180
FACU species	5	x 4 =	20
UPL species		x 5 =	
Column Totals:	160 (A)		340 (B)

Prevalence Index = B/A = 2.1

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-G Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
8"	10YR 4/2	100					sl	
12"	10YR 5/1	80%	10 YR 4/4	20			sl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐



Description: View of wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 8/11/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-G Up

Investigator(s): M. Turgeon Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Slope Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: -71.562574 Long: 42.103476 Datum: NAD83

Soil Map Unit Name: Scituate fine sandy loam, 3 to 8 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [ ]	No [✓]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soil Present?	Yes [ ]	No [✓]	
Wetland Hydrology Present?	Yes [ ]	No [✓]	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres on Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Stunted or Stressed Plants (D1)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] Microtopographic Relief (D4)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes [ ]	No [✓]	Depth (inches):
Water Table Present?	Yes [ ]	No [✓]	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes [ ]	No [✓]	Depth (inches):

Wetland Hydrology Present? Yes [ ] No [✓]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-G Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Ulmus Americana, American Elm	10	yes	facw
2.			
3.			
4.			
5.			
6.			
7.			
	10 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Digitaria sanguinalis, Crabgrass	30	yes	facu
2. Solidago Canadensis, Canada Goldenrod	30	yes	facu
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. Rubus occidentalis	10	no	upl
2. Celastrus scandens	50	yes	facu
3.			
4.			
	60 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	0	x 3 =	0
FACU species	110	x 4 =	440
UPL species	10	x 5 =	50
Column Totals:	130 (A)		510 (B)

Prevalence Index = B/A = 3.9

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-G Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 5/4	100					LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 10/1/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-H & I Wet

Investigator(s): C. Barron, M. Seifert Section, Township, Range: See Flag #s in Remarks

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.101284 Long: -71.569199 Datum: NAD83

Soil Map Unit Name: Whitman sandy loam, 0 to 3 percent slopes NWI classification: Not shown on NWI

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

-This datasheet reflects both HNTB-H and HNTB-I
-HNTB-I & HNTB-H connect via culvert(s) under roadway.
-Flag #s: HNTB-H-1 - HNTB-H-16, HNTB-I-1 - HNTB I-12
-3 culverts empty into HNTB-H -- Located at flag #s H-3, 5, & 10
-Culvert at H-10 nearly buried, with 3'x3' eroded hole filled with water at opening. Water appears to flow underground to drain into HNTB-H.
-Wetland includes small drainage channel located between flags H-9 & H-10 (includes upland island with knotweed, raspberry, multiflora rose, bittersweet)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☑ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9)
- ☑ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☑	No ☐	Depth (inches): 4"
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water outside of wetland plot - unknown frog species present

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-H & I Wet

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Clethra alnifolia	45	Yes	FAC
2. Viburnum dentatum	15	Yes	FAC
3. Ilex verticillata	15	Yes	FACW
4.			
5.			
6.			
7.			
	75 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Phalaris arundinacea	75	Yes	FACW
2. Typha latifolia	15	No	OBL
3. Clethra alnifolia	15	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	105 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. Toxicodendron radicans	10	Yes	FAC
2.			
3.			
4.			
	10 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-H & I Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2"	10YR 2/1	100					Oa	Mostly decomposed
2-16"	10YR 2/1	80	10YR 5/1	20	D	M	CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☑ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐



Description: View of wetland HNTB-H datapoint.



Description: View of wetland HNTB-I near culvert at roadway.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 10/1/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-H & I Up

Investigator(s): C. Barron, M. Seifert Section, Township, Range:

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.101254 Long: -71.569217 Datum: NAD83

Soil Map Unit Name: Whitman sandy loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

-This datasheet reflects both HNTB-H Up and HNTB-I Up

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-H & I Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Yes	FAC
2. Quercus rubra	25	Yes	FACU
3. Fraxinus americana	15	Yes	FACU
4.			
5.			
6.			
7.			
	70	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1. Clethra alnifolia	40	Yes	FAC
2. Viburnum dentatum	10	No	FAC
3. Quercus alba	10	No	FACU
4. Vaccinium corymbosum	10	No	FACW
5.			
6.			
7.			
	70	= Total Cover	

Herb Stratum (Plot size: 5')			
1. Solidago canadensis	25	Yes	FACU
2. Phalaris arundinacea	20	Yes	FACW
3. Carex squarrosa	10	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	55	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1. Toxicodendron radicans	20	Yes	FAC
2. Parthenocissus quinquefolia	10	Yes	FACU
3.			
4.			
	30	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	30	x 2 =	60
FAC species	100	x 3 =	300
FACU species	85	x 4 =	340
UPL species	0	x 5 =	0
Column Totals:	225 (A)		710 (B)

Prevalence Index = B/A = 3.16

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-H & I Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-1"	10YR 2/2	100					LS	
1-16"	10YR 3/3	100					LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock

Depth (inches): 12"

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 10/1/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-J WET

Investigator(s): C. Barron, M. Seifert Section, Township, Range: Flag #s: HNTB-J-1 - HNTB-J-11

Landform (hillslope, terrace, etc.): None Local relief (concave, convex, none): Concave Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.102238 Long: -71.569443 Datum: NAD83

Soil Map Unit Name: Whitman sandy loam, 0 to 3 percent slopes NWI classification: Not shown on NWI

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 2"

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

-Low area adjacent to old rock wall

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-J WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Yes	FAC
2. Prunus serotina	20	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Ilex verticillata	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Matteuccia struthiopteris	30	Yes	FAC
2. Impatiens capensis	15	Yes	OBL
3. Cardamine hirsuta	10	No	FACU
4. Toxicodendron radicans	10	No	FAC
5. Arisaema triphyllum	5	No	FAC
6. Eurybia divaricata	5	No	--
7. Onoclea sensibilis	2	No	FACW
8.			
9.			
10.			
11.			
12.			
	77	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1. Parthenocissus quinquefolia	20	Yes	FACU
2. Smilax rotundifolia	10	Yes	FAC
3.			
4.			
	30	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 71% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-J WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8"	10YR 2/1	100					SIL	
8-16"	10YR 5/1	60					SIL	
	10YR 2/1	40						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:



Description: View of wetland datapoint.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mendon - Route 16 City/County: Worcester County Sampling Date: 10/1/2020

Applicant/Owner: MassDOT State: MA Sampling Point: HNTB-J Up

Investigator(s): C. Barron, M. Seifert Section, Township, Range:

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope (%):

Subregion (LRR or MLRA): R (144A) Lat: 42.102374 Long: -71.569312 Datum: NAD83

Soil Map Unit Name: Whitman sandy loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☐	No ☑	
Wetland Hydrology Present?	Yes ☐	No ☑	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☑ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches):
Water Table Present?	Yes ☐	No ☑	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: HNTB-J Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	60	Yes	FAC
2. Betula lenta	25	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	85	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Ilex verticillata	10	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Matteuccia struthiopteris	40	Yes	FAC
2. Pinus strobus	10	Yes	FACU
3. Berberis thunbergii	5	No	FACU
4. Aralia nudicaulis	5	No	FACU
5. Quercus alba	2	No	FACU
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	62	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1. Smilax rotundifolia	10	Yes	FAC
2.			
3.			
4.			
	10	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	110	x 3 =	330
FACU species	47	x 4 =	188
UPL species	0	x 5 =	0
Column Totals:	167 (A)		538 (B)

Prevalence Index = B/A = 3.22

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: HNTB-J Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10"	10YR 2/1	100					silt loam	
10-14"	10YR 5/6	90	10YR 4/6	5	C	M	silt loam	
	10YR 2/1	5						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
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Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock

Depth (inches): 14"

Hydric Soil Present? Yes ☐ No ☑

Remarks:



Description: View of upland datapoint.

Project: Mendon - Route 16		**Feature ID:** Muddy Brook
Date: 8/7/2020	**State:** MA	**Photos:** See attached
Crew: L. McDonald, M. Turgeon	**County:** Worcester	**Last Flag Number:** HNTB-Bank-1-9 (N of Rte 16) & HNTB-Bank-1-11 (S of Rte 16)

Feature Hydrologic Class (check one):

Tidal	Perennial	Intermittent	Ephemeral
TNW (Subject to ebb and flow)	TNW – Perennial (Flowing year round)	RPW – Seasonal (must flow at least 3 months a year)	Non-RPW draining uplands
	X RPW – Perennial (Flowing year round)		Non-RPW erosional feature
			Non-RPW with abutting wetland
			Non-RPW with adjacent wetland
Describe rational for hydrologic class: Observed flow. Muddy Brook flows southeast through large box culvert under Route 16.			Non-RPW wetland adjacent or abutting upstream (outside of study area)

Hydrologic Connectivity –	Upstream:Unknown	Downstream: Unknown	Adjacent/Abutting: Wetlands C, D, E

Feature Description: ***(check all that apply)***

Shape (with respect to OHW)			Substrate						Vegetation Cover Type (MBSS)
X	Natural Channel Shape	Width: 10-15 feet		Silts	X	Sands		Muck	RB: forested wetland
	Artificial (man-made)	Depth: 0-12"	X	Cobbles	X	Gravel		Other:	
	Manipulated (man-altered)	Bank Erosion/stability: Moderately eroded		Bedrock		Concrete			LB: forested wetland
	Other:		Side slope: ☐ ≥1:1 ☒ 2:1 ☒ 3:1 ☐ ≤4:1						
Notes: Adj veg includes red maple, skunk cabbage, sweet pepperbush, raspberry. Small intermittent stream along right bank within wetland D.									

Weather/Precipitation Conditions:

During Field Visit		Inches of Rain Within Last Week		Monthly Drought Condition NCDC Regional PDSI http://www.ncdc.noaa.gov/temp-and-precip/climatological-rankings/index.php **Month:** December **Year:** 2019												
X	No rain		0-0.5								X					
	Light rain		0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
	Heavy Rain	X	>1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet		

Non-tidal tributary has: (*check all that apply; include photos for each & list photo #)*

Bed and Banks		Ordinary High Water Mark							
X	Yes	X	Clear, natural line impressed on the bank	X	Sediment deposition	X	Sediment sorting
	No		Changes in the character of soil		Water staining	X	Scour
		X	Shelving	X	Presence of flood litter/debris	X	Observed/predicted flow events
			Vegetation matted down, bent, or absent		Destruction of terrestrial veg.		Abrupt change in plant community
			Leaf litter disturbed		Presence of wrack line		Other:

Tidal tributary has: (*check all that apply; include photos for each & list photo #)*

High Tide Line		Mean High Water Mark indicated by:		Chemical Characteristics	
	Oil or scum line along shore objects		Survey to available datum		Water is clear
	Fine shell or debris deposits (foreshore)		Physical markings		Water is discolored
	Physical markings/characteristics		Vegetation lines/changes in types		Oily film
	Tidal gauges				Other:
Notes:					



Photo 1: View of channel north of Route 16, facing upstream. Taken 8/7/2020.

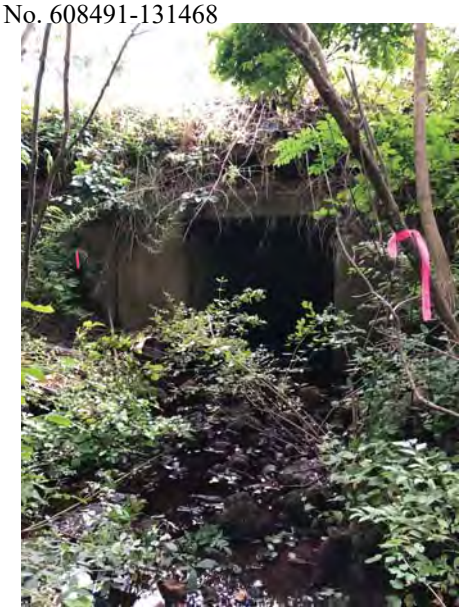


Photo 2: View of channel and culvert north of Route 16, facing downstream. Taken 8/7/2020.



Photo 3: View of channel south of Route 16, facing upstream. Taken 8/7/2020.



Photo 4: View of channel south of Route 16, facing downstream. Taken 8/7/2020.

Project: Mendon - Route 16		**Feature ID:** Willow Brook
Date: 8/7/2020	**State:** MA	**Photos:** See attached
Crew: L. McDonald, M. Turgeon	**County:** Worcester	**Last Flag Number:** Flag #s HNTB-Bank-1 -- HNTB-Bank-10

Feature Hydrologic Class (check one):

Tidal	Perennial	Intermittent	Ephemeral
TNW (Subject to ebb and flow)	TNW – Perennial (Flowing year round)	X RPW – Seasonal (must flow at least 3 months a year)	Non-RPW draining uplands
	RPW – Perennial (Flowing year round)		Non-RPW erosional feature
			Non-RPW with abutting wetland
			Non-RPW with adjacent wetland
Describe rational for hydrologic class: Observed flow. Willow Brook flows through culvert under Route 16			Non-RPW wetland adjacent or abutting upstream (outside of study area)

Hydrologic Connectivity –	Upstream:Unknown	Downstream: Unknown	Adjacent/Abutting: Wetland F

Feature Description: ***(check all that apply)***

Shape (with respect to OHW)			Substrate						Vegetation Cover Type (MBSS)
X	Natural Channel Shape	Width: 8 feet		Silts	X	Sands	X	Muck	RB: forested wetland & upland area
	Artificial (man-made)	Depth: 0-12"		Cobbles	X	Gravel		Other:	LB: forested wetland & upland area
X	Manipulated (man-altered)	Bank Erosion/stability: Moderately stable		Bedrock		Concrete			
	Other:		Side slope: ☐ ≥1:1 ☒ 2:1 ☒ 3:1 ☐ ≤4:1						
Notes: N of Route 16 -- Wier structure 15' from culvert.; S of Rte 16 to Maple Street - Stone walls on both banks; S of Maple St (outside study area) -- steep natural slopes									

Weather/Precipitation Conditions:

During Field Visit		Inches of Rain Within Last Week		Monthly Drought Condition NCDC Regional PDSI http://www.ncdc.noaa.gov/temp-and-precip/climatological-rankings/index.php **Month:** July **Year:** 2020												
X	No rain		0-0.5								X					
	Light rain		0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
	Heavy Rain	X	>1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet		

Non-tidal tributary has: (*check all that apply; include photos for each & list photo #)*

Bed and Banks		Ordinary High Water Mark							
X	Yes	X	Clear, natural line impressed on the bank	X	Sediment deposition		Sediment sorting		
	No		Changes in the character of soil	X	Water staining	X	Scour		
		X	Shelving		Presence of flood litter/debris	X	Observed/predicted flow events		
			Vegetation matted down, bent, or absent		Destruction of terrestrial veg.		Abrupt change in plant community		
			Leaf litter disturbed		Presence of wrack line		Other:		

Tidal tributary has: (*check all that apply; include photos for each & list photo #)*

High Tide Line		Mean High Water Mark indicated by:		Chemical Characteristics	
	Oil or scum line along shore objects		Survey to available datum		Water is clear
	Fine shell or debris deposits (foreshore)		Physical markings		Water is discolored
	Physical markings/characteristics		Vegetation lines/changes in types		Oily film
	Tidal gauges				Other:
Notes:					



Photo 1: View of channel north of Route 16, facing upstream. Taken 8/7/2020.

Appendix C – Project Design Plans

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	38
PROJECT FILE NO.	608491		

TITLE

PLAN AND PROFILE OF

UXBRIDGE ROAD, HASTINGS STREET, MILFORD STREET (ROUTE 16)

IN THE TOWN OF

MENDON

WORCESTER COUNTY

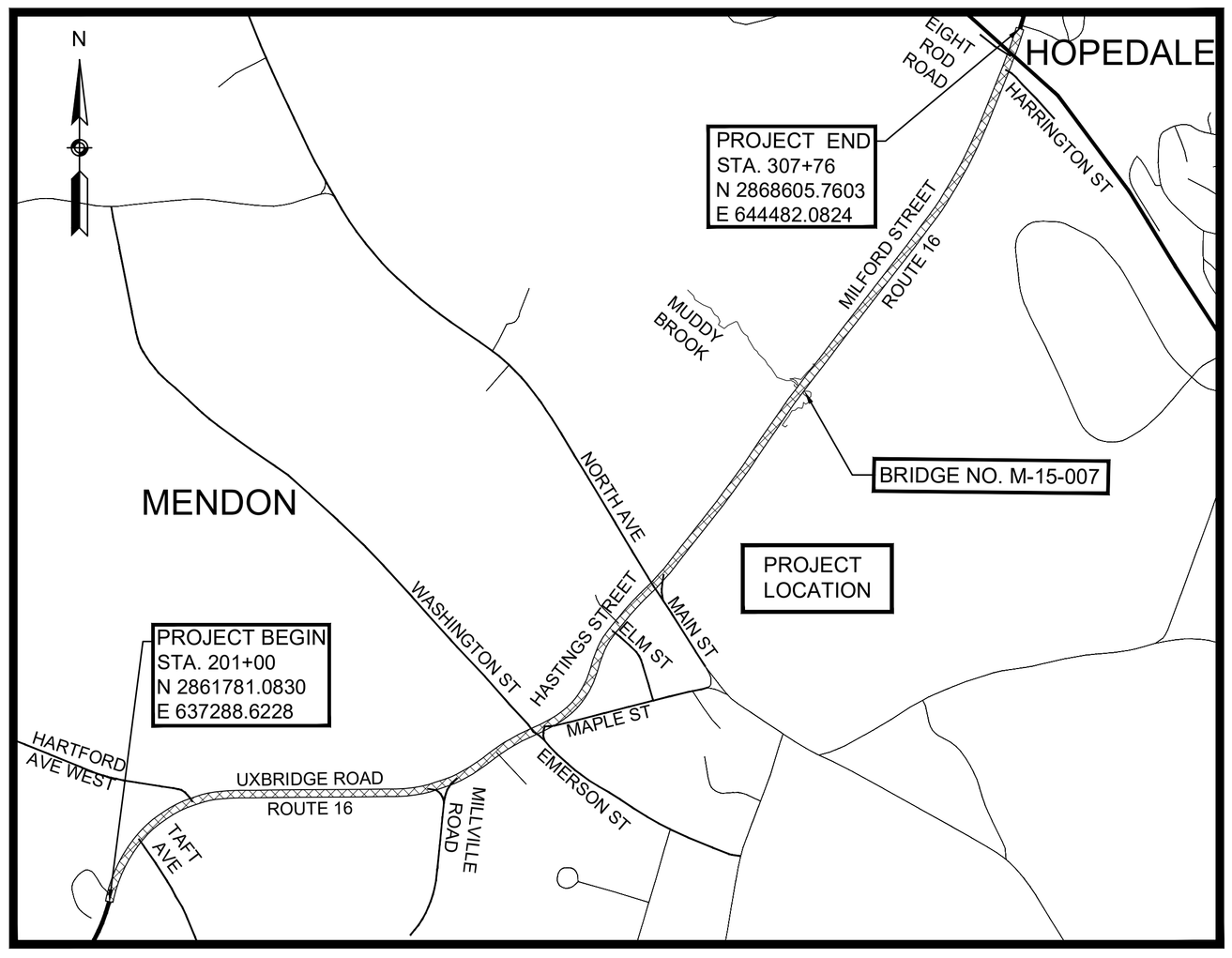
FEDERAL AID PROJECT NO.

THESE PLANS ARE SUPPLEMENTED BY THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK.

ENVIRONMENTAL SITE PLANS

INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET & INDEX
2	LEGEND & ABBREVIATIONS
3	GENERAL NOTES
4	KEY PLAN
5 - 25	CONSTRUCTION PLANS
26 - 28	CULVERT FLOOD SECTIONS
29 - 33	CULVERT PLANS
34	CONTROL OF WATER PLAN
35 - 38	CONSTRUCTION DETAILS



0 800 1600 2400 3200

SCALE: 1" = 800'

LENGTH OF PROJECT = 10,676.00 FEET = 2.022 MILES

DESIGN DESIGNATION (ROUTE 16)

DESIGN SPEED	STATION
45 MPH	STA. 201+00 TO STA. 239+00
40 MPH	STA. 239+00 TO STA. 261+00
50 MPH	STA. 261+00 TO STA. 301+00
45 MPH	STA. 301+00 TO STA. 307+75
ADT (2019)	18,300
ADT (2031)	19,300
K	8.0%
D	75.0% EB
T (PEAK HOUR)	3.2%
T (AVERAGE DAY)	2.9%
DHV	1,534
DDHV	1,145 EB
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL

COMMONWEALTH OF MASSACHUSETTS
JAMES T. BARNACK
CIVIL
No. 50900
REGISTERED PROFESSIONAL ENGINEER

07/10/2024

DATE	DESCRIPTION	REV #
02/23/24	100% DESIGN SUBMISSION	0
03/17/23	75% DESIGN SUBMISSION	0
07/30/21	25% DESIGN SUBMISSION	0

massDOT
Massachusetts Department of Transportation
Highway Division

APPROVED

CHIEF ENGINEER _____ DATE _____

HNTB
31 ST. JAMES AVE SUITE 300
BOSTON, MA 02116

Proposal No. 608491-131468
A00869 - 134

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
C	C	CABLE MANHOLE
D	D	DRAINAGE MANHOLE
E	E	ELECTRIC MANHOLE
G	G	GAS MANHOLE
M	M	MISC MANHOLE
S	S	SEWER MANHOLE
T	T	TELEPHONE MANHOLE
W	W	WATER MANHOLE
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
MON		MONUMENT
SB		STONE BOUND
TB		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UPL	UPL	UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		TREE PROTECTION
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
99		CONTOURS (ON-THE-GROUND SURVEY DATA)
100 99		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT CONTROL BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT BUFFER ZONE
		200 FT RIVERFRONT AREA
		LIMIT OF BORDERING LAND SUBJECTED TO FLOOD (BLSF)
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING (REM)	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR
		VIDEO DETECTION ZONE
		VIDEO DETECTION CAMERA
		PEDESTRIAN PUSH BUTTON, SIGN, AND SADDLE
		EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		PEDESTRIAN SIGNAL HEAD
		SIGNAL POST AND BASE
		MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		SPAN POLE
		SIGN AND POST
		SIGN AND POST (2 POSTS)
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE (12"/24" WIDE)
	CW	CROSSWALK (12" WIDE)
	SWL	SOLID WHITE LINE (6" WIDE)
	SYL	SOLID YELLOW LINE (6" WIDE)
	BWL	BROKEN WHITE LINE (6" WIDE)
	BYL	BROKEN YELLOW LINE (6" WIDE)
	DWL	DOTTED WHITE LINE (6" WIDE, 3' LINE SEGMENT, 9' BREAKS)
	DYL	DOTTED YELLOW LINE (6" WIDE, 3' LINE SEGMENT, 9' BREAKS)
	DWLEx	DOTTED WHITE LINE EXTENSION (6" WIDE, 2' LINE SEGMENT, 6' BREAKS)
	DYLEx	DOTTED YELLOW LINE EXTENSION (6" WIDE, 2' LINE SEGMENT, 6' BREAKS)
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE
	YL	YIELD LINE
		BIKE LANE MARKING
		BIKE DETECTOR MARKING
		SHARED USE LANE MARKING
		1-WAY WHITE SLOTTED PAVEMENT MARKER
		2-WAY YELLOW/YELLOW SLOTTED PAVEMENT MARKER
		1-WAY YELLOW SLOTTED PAVEMENT MARKER

ALL PAVEMENT MARKINGS SHALL BE RECESSED POLYUREA UNLESS OTHERWISE SPECIFIED.

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ECCEN	ECCENTRIC
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
ER	EASTERN REDBUD
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
JCT	JUNCTION
L	LENGTH OF CURVE
LSA	LANDSCAPE AREA
LB	LEACH BASIN
LD	LONDON PLANETREE
LP	LIGHT POLE
LT	LEFT
LST	LOW SEATED TIMBER
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
NTS	NOT TO SCALE
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PCR	PEDESTRIAN CURB RAMP
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PROJ	PROJECT
PROP	PROPOSED

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	38
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LEGEND & ABBREVIATIONS

ABBREVIATIONS (cont.)

GENERAL

PSB	PORTABLE SOIL BORROW
PT	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PVMT	PAVEMENT
PWW	PAVED WATERWAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SUP	SHARED USE PATH
SW	SIDEWALK
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TP	TREE PROTECTION
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

TRAFFIC SIGNAL ABBREVIATIONS

CAB	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY UPRAISED HAND
FDW	FLASHING UPRAISED HAND
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR YELLOW
FYL	FLASHING YELLOW LEFT ARROW
FYR	FLASHING YELLOW RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALKING PERSON
Y	STEADY CIRCULAR YELLOW
YL	STEADY YELLOW LEFT ARROW

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	38
PROJECT FILE NO.	608491		

GEN NOTES

GENERAL NOTES

1. THIS BASEMAPPING WAS PREPARED BY NITSCH ENGINEERING IN JULY-SEPTEMBER, 2018, UTILIZING VARIOUS SURVEY EQUIPMENT TO INCLUDE LEICA TPS 1200 TOTAL STATION, LEICA GS14 GPS AND TERRESTRIAL MOBILE LIDAR. FIELD UPDATES AND ADDITIONAL TOPOGRAHIC DATA WAS COLLECTED IN OCTOBER 2020.

2. WETLANDS WERE DELINEATED BY HNTB IN ACCORDANCE WITH THE MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION BETWEEN AUGUST 7, 2020 AND OCTOBER 1, 2020. AND VERIFIED ON OCTOBER 4, 2023. WETLAND FLAGS WERE LOCATED BY HNTB UTILIZING EOS ARROW 100 GNSS GPS UNIT WITH SUBMETER ACCURACY.

3. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXISTING GRADES AND ELEVATIONS. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY GRADE DISCREPANCIES PRIOR TO CONSTRUCTION.

4. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION.

5. PEDESTRIAN AND VEHICLE ACCESS TO ABUTTING PREMISES WILL BE MAINTAINED AT ALL TIMES AS DIRECTED BY THE ENGINEER. EMERGENCY VEHICLE ACCESS SHALL BE MAINTAINED AT ALL TIMES.

6. CONTRACTOR SHALL BE LIMITED TO CONSTRUCTION ACTIVITIES WITHIN THE IDENTIFIED LIMITS OF WORK AS SHOWN ON THE PLANS, OR AS DIRECTED TO DO SO BY THE ENGINEER.

7. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FROM THE TOWN AND APPLICABLE AGENCIES PRIOR TO COMMENCING WORK.

8. CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITY SERVICES AND HIGHWAY LIGHTING THROUGHOUT CONSTRUCTION UNTIL AND UNLESS THEY ARE REPLACED PER THE CONTRACT.

9. ALL GRANITE CURB THAT IS REMOVED SHALL BE RESET OR DISCARDED AS REQUIRED BY THE ENGINEER. GRANITE CURB THAT IS TO BE RESET SHALL NOT BE RANDOMLY MIXED WITH NEW CURB, BUT SHALL BE RESET SO AS TO GIVE A UNIFORM APPEARANCE.

10. DEWATERING IS LIKELY TO BE REQUIRED AT THE MUDDY BROOK CULVERT EXTENSIONS AND WORK ON THE DRAINAGE IMPROVEMENTS. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EXTENT OF DEWATERING REQUIRED AND TO PROPOSE THE MOST APPROPRIATE METHODS AND MATERIALS FOR DEWATERING THAT WILL ULTIMATELY BE APPROVED BY THE MASSDOT PROJECT ENGINEER. PLANS AND CALCULATIONS FOR ALL WATER CONTROL MEASURES WILL BE DEVELOPED BY THE CONTRACTOR, STAMPED BY A PROFESSIONAL CIVIL ENGINEER REGISTERED IN THE COMMONWEALTH, AND SUBMITTED TO MASSDOT'S PROJECT ENGINEER FOR APPROVAL PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

11. ALL DEWATERING AND/OR PUMP-AROUND RELATED EARTHWORK WILL BE CONDUCTED IN SUCH A MANNER AS TO PREVENT POTENTIAL SILTATION AND CONTAMINATION OF THE WETLANDS AND WATERWAYS WITHIN THE PROJECT LIMITS. ANY PUMPING DISCHARGE WILL NOT BE ALLOWED TO ENTER DIRECTLY INTO STREAMS OR ADJACENT WETLAND RESOURCE AREAS. WATER FROM THE WORK AREA WILL BE PUMPED TO A SEDIMENT FILTER BAG, WHICH WILL BE PLACED IN AN UPLAND AREA AND ENCIRCLED WITH COMPOST FILTER TUBES OR STRAW WATTLES. DEWATERING WILL BE CAREFULLY MONITORED TO ENSURE THAT THE WATER IS NOT PUMPED FASTER THAN IT CAN BE TREATED AND WILL BE TIMED TO AVOID PERIODS OF HIGH FLOW. ALL FILTERED SEDIMENTS WILL BE REMOVED FROM THE PROJECT AREA AND DISPOSED OFF-SITE. ONCE ALL CONSTRUCTION IN DEWATERED AREAS IS COMPLETE, THE ENTIRE WATER CONTROL SYSTEM STRUCTURE WILL BE REMOVED FROM THE SITE.

12. CONTRACTOR TO REMOVE AND STACK EXIST TOWN OF MENDON BANNERS ON UTILITY POLES. CONTRACTOR TO LEAVE ALL BANNERS AND BRACKETS AT THE TOWN HIGHWAY DEPARTMENT, ADDRESS 66 PROVIDENCE ST. MENDON, MA. 01756

DRAINAGE NOTES

1. CONTRACTOR SHALL VERIFY THE LOCATION OF THE EXISTING DRAINAGE SYSTEMS THAT ARE SHOWN ON THE DRAINAGE PLANS. WHERE EXISTING DRAINAGE IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION, AND SIZE SHALL BE ACCURATELY DETERMINED AND THE CONTRACTOR SHALL CONFIRM WHETHER THE DRAINAGE SYSTEM IS STILL ACTIVE. THE INFORMATION SHALL BE FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT. ALL ACTIVE DRAINAGE SYSTEMS IN CONFLICT WITH THE PROPOSED WORK SHALL BE RELOCATED IN KIND IN SUCH A MANNER AS TO AVOID IMPACTS TO PROPOSED ITEMS AND UTILITIES AS WELL AS IMPACTS TO EXISTING ITEMS AND UTILITIES TO REMAIN. IF DRAINAGE SYSTEM IS FOUND TO BE INACTIVE IT SHALL BE REMOVED OR FILLED IN-PLACE PER THE APPROVAL OF THE ENGINEER.

2. NO EXISTING DRAINAGE SYSTEMS SHALL BE ABANDONED, PLUGGED OR REMOVED WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.

3. PRECAST DRAINAGE STRUCTURES SHALL COMPLY WITH ASTM C-478 (CIRCULAR MANHOLES AND CATCH BASINS) AND ASTM C-913 (RECTANGULAR MANHOLES AND CATCH BASINS) AND ALL APPLICABLE ASSOCIATED ASTM STANDARDS.

4. PRECAST CONCRETE RINGS OR NON-SHRINK GROUT SHALL BE USED FOR GRADE ADJUSTMENTS.

5. CONTRACTOR SHALL CLEAN AND MAKE FUNCTIONAL ALL EXISTING STRUCTURES AND PIPING WITHIN THE LIMIT OF WORK. ALL EXISTING AND/OR PROPOSED DRAINAGE STRUCTURES AND PIPES WITHIN THE LIMIT OF WORK SHALL AGAIN BE CLEANED PRIOR TO CONCLUSION OF THE CONTRACT.

6, SHOULD DAMAGE OF ANY KIND OCCUR TO EXISTING PIPES AND STRUCTURES, THE CONTRACTOR SHALL MAKE REPAIRS, AT HIS OR HER OWN EXPENSE, TO THE SATISFACTION OF THE ENGINEER AND UTILITY OWNER.

7. GRADING SHALL PROVIDE POSITIVE DRAINAGE TO ALL DRAIN INLET STRUCTURES.

8. DURING CONSTRUCTION, ALL STRUCTURES OF THE EXISTING SYSTEM AND NEW SYSTEM OF DRAINS SHALL BE PROTECTED AGAINST SEDIMENTATION AND DEBRIS.

9. ALL DRAINAGE STRUCTURES AND PIPING SHALL BE DESIGNED AND CONSTRUCTED TO WITHSTAND REQUIRED LOADING, AS SHOWN IN THE CONTRACT DOCUMENTS.

10. PROPOSED INVERTS ON PLANS ARE SHOWN FOR BIDDING PURPOSES ONLY. ACTUAL INVERT ELEVATIONS WILL BE CONFIRMED IN THE FIELD.

11. DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY, BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES THE ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY STRUCTURES BE ORDERED. ANY FIELD ADJUSTMENTS TO LINE & GRADE UP TO A DEPTH OF 5' SHALL BE INCLUDED IN THE COST OF THE PIPE. PIPE EXCAVATION GREATER THAN 5' WILL BE PAID UNDER CLASS B TRENCH EXCAVATION.

UTILITY NOTES

1. ALL UNDERGROUND UTILITIES AS SHOWN WERE COMPILED USING FIELD SURVEY INFORMATION AND AVAILABLE RECORD INFORMATION.

2. RECORD UTILITY INFORMATION FROM THE VARIOUS UTILITY COMPANIES AND PUBLIC AGENCIES, ARE APPROXIMATE ONLY AND ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD.

3. ALL UTILITY COMPANIES, PUBLIC AND PRIVATE MUST BE NOTIFIED, INCLUDING THOSE IN CONTROL OF UTILITIES NOT SHOWN ON THIS PLAN, (SEE CHAPTER 370, ACTS OF 1963, MASSACHUSETTS) PRIOR TO DESIGNING, EXCAVATING, BLASTING, INSTALLING, BACKFILLING, GRADING, PAVEMENT RESTORING OR REPAVING.

4. THE LOCATION OF EXISTING PIPES OR OTHER UNDERGROUND STRUCTURES OR PROPERTY LINES ARE NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL UNDERGROUND PIPES OR STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL CALL "DIG SAFE" (1-888-344-7233) 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS) PRIOR TO ANY EXCAVATION TO OBTAIN ACCURATE UTILITY LOCATIONS.

5. SUBSURFACE UTILITY LOCATIONS HAVE BEEN PLOTTED TO MEET UTILITY QUALITY LEVEL "C" AS DESCRIBED IN ASCE STANDARD 38-02 AND SUMMARIZED HERE. THE UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS BASED ON ABOVE-GROUND FIELD OBSERVATION AND EXISTING RECORD INFORMATION RECEIVED FROM UTILITY STAKE-HOLDERS.

6. IN ACCORDANCE WITH MGL CHAPTER 82, SECTION 40, 40A-40E INCLUDING AMENDMENTS, THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES, TOWN OF MENDON AND HOPEDALE, AND GOVERNMENT AGENCIES INCLUDED IN THIS PROJECT IN WRITING PRIOR TO ANY EXCAVATION WORK. CALL "DIG SAFE" AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK.

7. INVERTS SHOWN ON PLAN ARE NOT GUARANTEED TO BE ACCURATE. DUE TO THE LIMITATIONS OF FIELD OBSERVATION AND SURVEY TECHNIQUES THE INVERTS ARE SHOWN AS APPROXIMATE ONLY AND SHALL NOT BE WARRANTED TO BE CORRECT. ADDITIONAL FIELD INVESTIGATION IS NECESSARY WHERE ACCURATE MEASUREMENTS ARE REQUIRED FOR DESIGN OF CRITICAL AREAS.

8. THE EXISTING CONDITIONS PLAN IS TO BE USED FOR THE SPECIFIED PROJECT ONLY AND IS NOT WARRANTED TO BE COMPLETE FOR ANY OTHER FUTURE PROJECTS.

9. CONTRACTOR SHALL CONDUCT SUBSURFACE INVESTIGATIONS TO IDENTIFY GROUND WATER ELEVATION PRIOR TO CONSTRUCTION.

10. TREE TRIMMING AND SELECTIVE THINNING SHOULD OCCUR AT ANY NEW UTILITY POLE AND PROVIDE 10' CLEAR WIDTH OF ALL OVERHEAD WIRES (OHW). CONTRACTOR TO CONFIRM CLEARING AND TREE TRIMMING LIMITS TO MINIMIZE TRIMMING TO THE MAXIMUM EXTENT POSSIBLE. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.

SURVEY NOTES

1. THE HORIZONTAL DATUM SHOWN HEREON REFERENCES THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MAINLAND ZONE, NAD83(2011) EPOCH 2010.0 IN US SURVEY FOOT.

2. THE VERTICAL DATUM SHOWN HEREON REFERENCES NAVD88, GEOID 12B.

3. GROUND CONTROL PROVIDED BY MASSDOT.

4. ABUTTERS PROPERTY LINES DEPICTED HEREON ARE APPROXIMATE ONLY AND ARE BASED A COMPILATION OF RECORD DEEDS AND PLANS.

5. THE BASE PLAN WAS PREPARED WITHOUT THE BENEFIT OF A TITLE SEARCH AND MAY NOT DISCLOSE ANY MATTERS THAT MAY BE REVEALED BY ONE.

6. THE BASE PLAN DOES NOT SHOW UNWRITTEN OR UNRECORDED EASEMENTS WHICH MAY EXIST. A REASONABLE AND DILIGENT ATTEMPT HAS BEEN MADE TO OBSERVE ANY APPARENT AND VISIBLE USES OF THE LAND. THE BASE PLAN DOES NOT GUARANTEE THAT NO SUCH EASEMENTS EXIST.

7. LEGAL STATUS OF EASEMENTS, WAYS AND RESTRICTIONS NOT DETERMINED BY THE SURVEY.

8. TITLE TO LAND IN THE ABUTTING WAYS IS NOT SHOWN AND HAS NOT BEEN DETERMINED AS A RESULT OF THE SURVEY.

9. THE RIGHT-OF-WAY LINES AND BASELINES SHOWN ON THE BASE PLAN ARE BASED ON STATE HIGHWAY LAYOUTS. THE MONUMENTS FOUND MARKING THE LAYOUT PLAN WERE FIELD LOCATED AND USED TO ESTABLISH THE RIGHT-OF-WAY LINES UTILIZING A BEST FIT SOLUTION.

10. DASHED BUILDING LINES ARE FROM MASSGIS AND ARE SHOWN FOR GRAPHICAL REFERENCE ONLY.

TRAFFIC NOTES

1. THE MINIMUM MOUNTING HEIGHT OF POST-MOUNTED SIGNS, MEASURED VERTICALLY FROM THE BOTTOM OF THE SIGN TO THE TOP OF THE CURB OR SIDEWALK, OR THE ELEVATION OF THE NEAR EDGE OF THE TRAVELED WAY, SHALL BE 7 FEET NEAR SIDEWALK AND 8 FEET NEAR SHARED USE PATH UNLESS OTHERWISE SPECIFIED ON THE PLANS.

2. TRAFFIC SIGNAL CONDUIT SHALL BE 3" SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.

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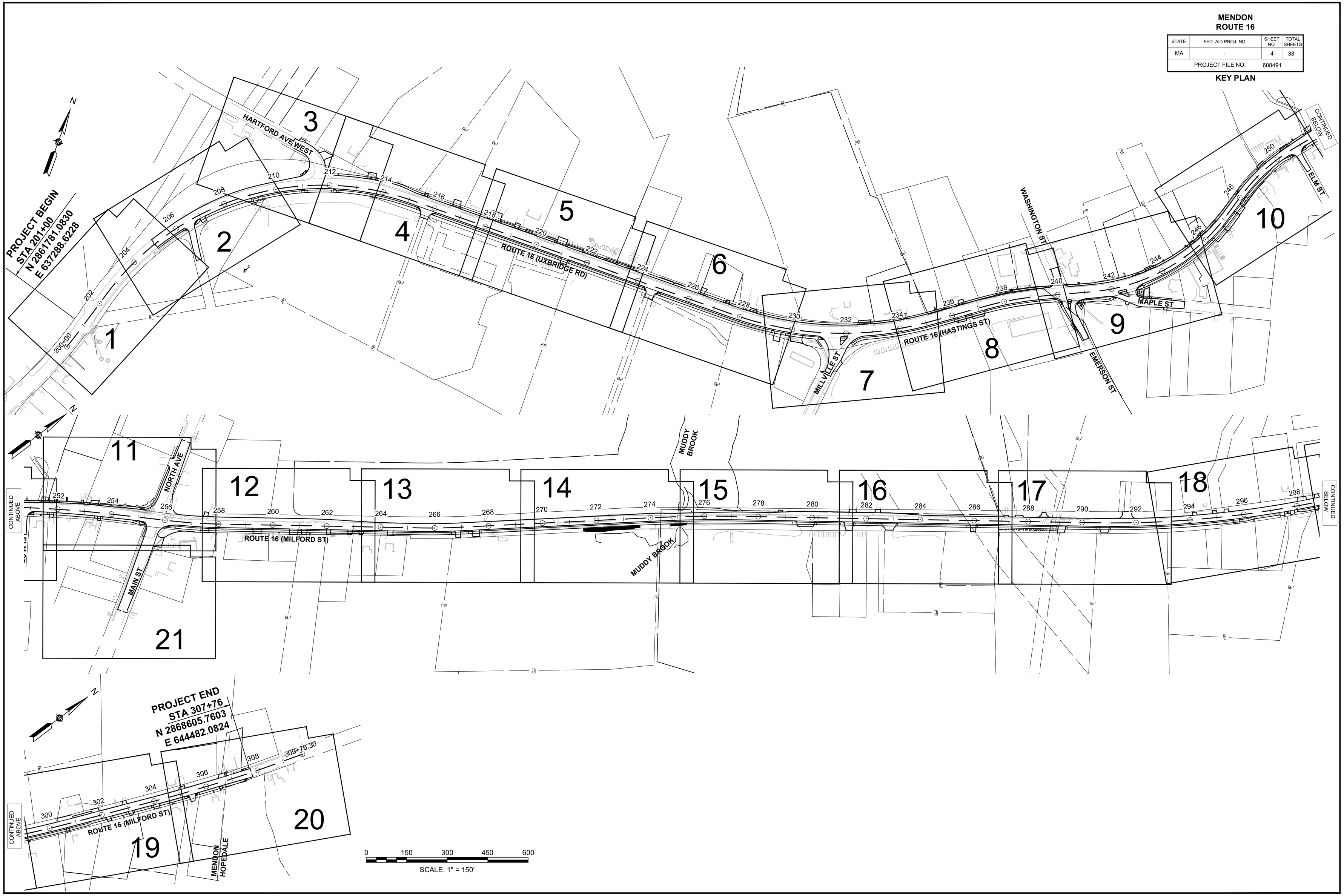
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MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	38
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KEY PLAN



MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 1 OF 21

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T1	TEMPORARY IMPACTS TO 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-H	385 SQ. FT
P1	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO CLEARING AND GRUBBING	HNTB-H	4432 SQ. FT
T2	TEMPORARY IMPACTS TO 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-I	360 SQ. FT
P2	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO CLEARING AND GRUBBING	HNTB-I	977 SQ. FT

LEGEND:

- = TEMPORARY IMPACT TO BANK
- = PERMANENT IMPACT TO BANK
- = TEMPORARY IMPACT TO RIVERFRONT AREA
- = PERMANENT IMPACT TO RIVERFRONT AREA
- = TEMPORARY IMPACT TO 100 FOOT BUFFER ZONE
- = PERMANENT IMPACT TO 100 FOOT BUFFER ZONE
- = TEMPORARY IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = PERMANENT IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = TEMPORARY IMPACT TO LAND UNDER WATER
- = PERMANENT IMPACT TO LAND UNDER WATER
- = WETLAND DELINEATION LINES
- = LIMIT OF 200 FOOT BUFFER RIVERFRONT AREA
- = BANK DELINEATION LINES
- = LIMIT OF BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = LIMIT OF 100 FOOT BUFFER ZONE

N

PROJECT BEGIN
STA 201+00
N 2861781.0830
E 637288.6228

100-FOOT BUFFER ZONE

PROP ROUTE 16 BL
PC +46.52
PT +78.21

200+00

Δ=72° 58' 39"
L=1267.33' R=995.00'

ROUTE 16
(UXBRIDGE ROAD)

BEGIN LIMIT OF PVMT
STANDARD MILLING & OVERLAY
STA 205+03
N 2862155.1904
E 637434.4297

LOCATION OF 1949 SHLO #3683
LOCATION OF 1950 SHLO #3739

WF HNTB I1
WF HNTB I2
WF HNTB I3
WF HNTB I4
WF HNTB I5
WF HNTB I6
WF HNTB I7
WF HNTB I8
WF HNTB I9
WF HNTB I10
WF HNTB I11
WF HNTB J9
WF HNTB J10
WF HNTB J11

WF HNTB H1
WF HNTB H2
WF HNTB H4
WF HNTB H5
WF HNTB H6
WF HNTB H7
WF HNTB H8
WF HNTB H9
WF HNTB H10
WF HNTB H11
WF HNTB H12
WF HNTB H13
WF HNTB H14
WF HNTB H15
WF HNTB H16

T1
T2
P1
P2

PROP LIMIT OF TREE CLEARING AND GRUBBING
PROP SEDIMENT CONTROL BARRIER
RET EXIST HWY GUARD
RET EXIST CEM CONC SW
PROP LIMIT OF TREE CLEARING AND GRUBBING
RET EXIST CURB
PROP SEDIMENT CONTROL BARRIER (TYP)
SAWCUT (TYP)
PROP FULL DEPTH PVMT
PROP LIMIT OF GRADING (TYP)
R&D EXIST HWY GUARD
PROP SEDIMENT CONTROL BARRIER
PROP FULL DEPTH PVMT
PROP CB
PROP STANDARD MILLING & OVERLAY
SAWCUT& MEET EXIST
PROP DMH
R&R RIP RAP

N/F
85 REALTY CORP.
BK/PG 62963/52
45 UXBRIDGE ROAD
PID 11-236-45

N/F
JANYCE-ANN MATHEWSON
BK/PG 37582/330
13 HARTFORD AVE WEST
PID 11-141-20

N/F
RTE. 85 REALTY CORP
L.C.C. No. 1399-I (LOTS B-12 & B-13)
CERT. No. 18166
DOC. No. 114030
44 UXBRIDGE ROAD
PID 11-236-44

N/F
PAULA CICCONI ANU
NELSON PACHECO
L.C.C. No. 1399-D (LOT B-10)
CERT. No. 18244
DOC. No. 114641
1 OLD TAFT AVENUE
PID 11-225-67

N/F
JOCELYN L. ARN
BK/PG 63463/348
1 TAFT AVE
PID 11-225-1

N/F
JOCELYN L. ARN
L.C.C. No. 1399-K (LOT 1)
CERT. No. 18447
DOC. No. 116641
1 TAFT AVENUE
PID 11-225-1

CONTINUED ON SHEET NO. 6

0 20 50 100
SCALE: 1" = 20'

Proposal No. 608491-131468
A00860-138

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	38
PROJECT FILE NO.		608491	

CONSTRUCTION PLANS
SHEET 2 OF 21

Proposal No. 608491-131468

A008660 - 139

WF HNTB J6
WF HNTB J7
WF HNTB J8
WF HNTB J9
WF HNTB J10
WF HNTB J11
WF HNTB I11
WF HNTB I10
WF HNTB I9
WF HNTB I8
WF HNTB H10
WF HNTB H11
WF HNTB H12
WF HNTB H9
WF HNTB H13
WF HNTB H14
B H8

100-FOOT BUFFER ZONE

N/F THEODORE J. LeDOUX AND MARSHA I. LeDOUX L.C.C. No. 1399-F (LOT A-2) CERT. No. 2484 DOC. No. 27123 6 HARTFORD AVE. WEST PID 11-141-6

1 STORY BUILDING

LOCATION OF 1949 SHLO #3683

BEGIN LIMIT OF PVMT STANDARD MILLING & OVERLAY
STA 205+03
N 2862155.1904
E 637434.4297

PROP ROUTE 16 ℄ STA. 206+57.94 =
PROP. TAFT AVE ℄ STA. 1000+00.00

PROP BMP AREA
PROP SEDIMENT CONTROL BARRIER (TYP)
T2
P2
R&D EXIST HWY GUARD
PROP CB
PROP LIMIT OF TREE CLEARING AND GRUBBING
PROP STANDARD MILLING & OVERLAY
PROP BMP AREA
PROP LIMIT OF GRADING (TYP)
REM 2 TREES AND STUMPS
PROP FES-1 (12" RCP)
PROP FULL DEPTH PVMT
PROP LIMIT OF TREE CLEARING AND GRUBBING

ROUTE 16 (UXBRIDGE ROAD)

Δ=72° 58' 39"
L=1267.33'
R=995.00'

CONTINUED ON SHEET NO. 5

SAWCUT & MEET EXIST
PROP DMH
SAWCUT (TYP)
R&R CURB
R&R RIP RAP
PROP FULL DEPTH PVMT
P1
T1
PROP LIMIT OF TREE CLEARING AND GRUBBING

PROP TAFT AVE BL
PROP DMH
PROP LOAM & SEED
PROP CB
PROP STANDARD MILLING & OVERLAY
PROP CEM CONC SUP AT DWY
PROP HMA DWY
PROP LIMIT OF TREE CLEARING AND GRUBBING
RET TREE
PROP 8' HMA SUP
PROP LIMIT OF TREE CLEARING AND GRUBBING
PROP HMA WALK
PROP LOAM & SEED
RET TREES
PROP LIMIT OF GRADING (TYP)
RET TREE
PROP CEM CONC SUP AT DWY
PROP LIMIT OF TREE CLEARING AND GRUBBING
RET EXIST RIP RAP
TEMP EASEMENT
PROP 8' HMA SUP
PROP LOAM & SEED
PROP DMH (TYP)
PROP CB (TYP)

TAFT AVENUE 1001

N/F JOCELYN L. ARN L.C.C. No. 1399-K (LOT 1) CERT. No. 18447 DOC. No. 116641 1 TAFT AVENUE PID 11-225-1

N/F WILLIAM M. ROCKWOOD, JR. CAROL A. ROCKWOOD L.C.C No. 1399-K (LOT 3) CERT. No. 10111 DOC. No. 37318 34 UXBRIDGE RD. PID 11-236-34

LIMIT OF STANDARD MILLING & OVERLAY
LIMIT OF WORK
STA 1001+50
N 2862156.6871
E 637609.4355
1001+69

CONTINUED ON SHEET NO. 7

LEGEND:

- = TEMPORARY IMPACT TO BANK
- = PERMANENT IMPACT TO BANK
- = TEMPORARY IMPACT TO RIVERFRONT AREA
- = PERMANENT IMPACT TO RIVERFRONT AREA
- = TEMPORARY IMPACT TO 100 FOOT BUFFER ZONE
- = PERMANENT IMPACT TO 100 FOOT BUFFER ZONE
- = TEMPORARY IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = PERMANENT IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = TEMPORARY IMPACT TO LAND UNDER WATER
- = PERMANENT IMPACT TO LAND UNDER WATER
- = WETLAND DELINEATION LINES
- = LIMIT OF 200 FOOT BUFFER RIVERFRONT AREA
- = BANK DELINEATION LINES
- = LIMIT OF BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = LIMIT OF 100 FOOT BUFFER ZONE

0 20 50 100
SCALE: 1" = 20'

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T1	TEMPORARY IMPACTS TO 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-H	385 SQ. FT
P1	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO CLEARING AND GRUBBING	HNTB-H	4432 SQ. FT
T2	TEMPORARY IMPACTS TO 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-I	360 SQ. FT
P2	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO CLEARING AND GRUBBING	HNTB-I	977 SQ. FT

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 3 OF 21

N

N/F DONNA R. COTE AND JESSICA E. SMITH BK/PG 63700/332 13 HARTFORD AVE WEST PID 11-141-13

OWNER UNKNOWN

N/F RANDI W. NUTTALL SR. BK/PG 32561/303 (TRACT III) 9 HARTFORD AVE WEST PID 11-141-9

N/F RANDI W. NUTTALL SR. BK/PG 32561/303 (TRACT II) 7 HARTFORD AVE WEST PID 11-141-7

N/F RANDI W. NUTTALL SR. BK/PG 32561/303 (TRACT I) PB/PL 217/123 5 HARTFORD AVE WEST PID 11-141-5

N/F PAUL A. RANDOR BK/PG 33215/104 PB/PL 227/59 3 HARTFORD AVE WEST PID 11-141-3

2 STORY BUILDING

N/F THEODORE J. LeDOUX AND MARSHA I. LeDOUX L.C.C. No. 1399-F (LOT A-2) CERT. No. 2484 DOC. No. 27123 6 HARTFORD AVE WEST PID 11-141-6

1 STORY BUILDING

N/F FRANKLIN OFFICE PARK REALTY CORPORATION BK/PG 45719/163 26 UXBRIDGE ROAD PID 11-236-26

N/F FRANKLIN OFFICE PARK REALTY CORP. BK/PG 43019/116 24 UXBRIDGE ROAD PID 11-236-24

LOCATION OF 1942 COUNTY LAYOUT DECREE #1046

LOCATION OF 1942 COUNTY LAYOUT DECREE # 1046

LOCATION OF 1949 SHLO #3683

HARTFORD AVENUE WEST

ROUTE 16 (UXBRIDGE ROAD)

LIMIT OF WORK
STA 1102+03
N 2862685.7503
E 637786.3299

1102+72 PROP HARTFORD AVE WEST BL

PROP ROUTE 16 BL

PROP ROUTE 16 ℄ STA. 211+57.98 =
PROP HARTFORD AVE ℄ STA. 1100+00.00

PT +63.62

PC +46.22

Δ=72° 58' 39"
L=1267.33' R=995.00'

34.00

39.22

PROP HMA DWY

PROP FULL DEPTH PVMT

PROP STANDARD MILLING & OVERLAY

SAWCUT (TYP)

PROP 6.5' CEM. CONC. SW

PROP 4" LOAM AND SEED (TYP)

PROP EOP

PROP LIMIT OF TREE CLEARING AND GRUBBING

PROP LIMIT OF GRADING (TYP)

PROP FES-1 (12" RCP)

PROP BMP AREA

PROP CEM CONC SW AT DWY

PERMANENT EASEMENT (TYP)

TEMP EASEMENT (TYP)

RET

PROP CEM CONC SUP AT DWY

PROP LOAM AND SEED (TYP)

PROP 8' HMA SUP

PROP DMH (TYP)

PROP CB (TYP)

P1 P2 P3 P4 P5 P6 P7 P8

D1 D2 D3 D4

CONTINUED ON SHEET NO. 8

CONTINUED ON SHEET NO. 6

0 20 50 100
SCALE: 1" = 20'

Proposal No. 608491-131468

A00860 - 140

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 4 OF 21

ROUTE 16 (UXBRIDGE ROAD)

N

N/F
PAUL A. RANDOR
BK/PG 33215/104
PB/PL 227/59
3 HARTFORD AVE WEST
PID 11-141-3

2 STORY BUILDING

N/F
KENNETH HAZARD
BK/PG 62507/255
23 UXBRIDGE ROAD
PID 11-236-23

N/F
BFPH REALTY TRUST
BK/PG 57083/ 59
PB/PL 178/80
21 UXBRIDGE ROAD
PID 11-236-21

N/F
FRANKLIN OFFICE PARK
REALTY CORP.
BK/PG 43019/116
24 UXBRIDGE ROAD
PID 11-236-24

N/F
MAJESTIC REALTY LLC
BK/PG 45350/310
PB/PL 879/124
20 UXBRIDGE ROAD
PID 11-236-20

PROP FULL DEPTH PVMT
PROP CEM CONC SW (WIDTH VARIES 5.50'-6.50')
TEMP EASEMENT (TYP)
PROP LIMIT OF GRADING
PROP STANDARD MILLING & OVERLAY
RET TREES
PROP FULL DEPTH PVMT
PROP CEM CONC SW AT DWY
PROP HMA DWY
PROP DMH (TYP)
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP 6.5' CEM CONC SW
BOAT STORAGE AREA
TEMP EASEMENT (TYP)
PROP 4" LOAM AND SEED
PROP CEM CONC SW AT DWY
PROP HMA DWY
PROP 6.5' CEM CONC SW
PROP 4" LOAM AND SEED
PROP FULL DEPTH PVMT
PROP CB (TYP)
PROP ROUTE 16 BL
PT +13.85
Δ=72° 58' 39"
L=1267.33' R=995.00'
CONTINUED ON SHEET NO. 7
CONTINUED ON SHEET NO. 9
PROP LIMIT OF GRADING (TYP)
PROP 8' HMA SUP
TEMP EASEMENT (TYP)
PROP 8' HMA SUP
PROP FULL DEPTH PVMT
R&D EXIST CONC SW
R&D EXIST PVMT
PROP 4" LOAM AND SEED
PROP FULL DEPTH PVMT
R&D EXIST PVMT
PROP 4" LOAM AND SEED
PROP 8' HMA SUP
15' WIDE ACCESS & UTILITY EASEMENT #13 BK/PG 45594/372
15' WIDE ACCESS & UTILITY EASEMENT #12 BK/PG 45594/372
UTILITY EASEMENT #14 BK/PG 45594/372
UTILITY EASEMENT #14 BK/PG 45594/372
APPRO SUBSU DRAINAGE

P7 P8 D3 D4 D5 D6 D7 P9 P10

0 20 50 100
SCALE: 1" = 20'

Proposal No. 608491-131468

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MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 5 OF 21

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
P3	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO SIDEWALK INSTALLATION, HMA DRIVEWAY AND DRAINAGE WORK	HNTB-G	10712 SQ. FT
P4	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO INSTALLATION OF SUP	HNTB-G	1433 SQ. FT

N

N/F BETHEL DEVELOPMENT TRUST BK/PG 5972/0114 PB/PL 178/11 17 UXBRIDGE ROAD PID 11-236-17

N/F QUIRK FAMILY REALTY TRUST BK/PG 36183/97 PB/PL 311/30 (PARCEL III) 11 UXBRIDGE ROAD PID 11-236-11

N/F QUIRK FAMILY REALTY TRUST BK/PG 36183/97 PB/PL 311/30 (PARCEL IV) 9 UXBRIDGE ROAD PID 11-236-9

TEMP EASEMENT (TYP)
PROP STONE MASONRY RET WALL "E" (SEE WALL DETAILS SHEET 202)
PROP CEM CONC SW AT DWY
PROP CEM CONC DWY
R&S FENCE
R&S GATE
PROP 6.5' CEM CONC SW
PROP LIMIT OF GRADING (TYP)
PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP SAWCUT (TYP)
PROP 6.5' CEM CONC SW
PROP CEM CONC SW AT DWY
PROP HMA DWY
PROP STANDARD MILLING & OVERLAY FROM STA. 220+15 TO STA. 220+30 LT
REM TREE AND STUMP
TEMP EASEMENT (TYP)
REM TREE AND STUMP
PROP CEM CONC SW AT DWY
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP SAWCUT
PROP HMA DWY
REM TREE AND STUMP
TEMP EASEMENT (TYP)
PROP 4" LOAM AND SEED
PROP SAWCUT
PROP HMA DWY
PROP CEM CONC SW AT DWY
100-FOOT BUFFER ZONE
REM 2 TREE AND STUMPS
P3
R&D EXIST LANDSCAPE
PROP CEM CONC SW AT DWY
PROP HMA DWY
REM 1 TREE AND STUMP
R&R POST
R&R POST
PROP FULL DEPTH PVMT
R&D LSA
PROP DMH (TYP)
PROP STANDARD MILLING & OVERLAY
PROP FULL DEPTH PVMT
PROP 4" LOAM AND SEED
R&D EXIST CEM CONC SW
R&R CURB
PROP 4" LOAM AND SEED
PROP 8' HMA SUP
PROP CEM CONC SUP AT DWY
PROP FULL DEPTH PVMT
PROP 4" LOAM AND SEED
PROP 8' HMA SUP
PROP CB (TYP)
TEMPORARY IMPACT
P4
100-FOOT BUFFER ZONE

CONTINUED ON SHEET NO. 8

CONTINUED ON SHEET NO. 10

43.00

218 219 220 221 222 223 224

PROP ROUTE 16 BL

N 89° 34' 28" E 1255.12'

ROUTE 16 (UXBRIDGE ROAD)

D7 D8 D9 D10 D11 D12 D13 D14

LOC. LINE OF 1949 SHLO 3683

UTILITY EASEMENT #16 BK/PG 45594/372

UTILITY EASEMENT #14 BK/PG 45594/372

APPROXIMATE SUBSURFACE DRAINAGE SYSTEM

N/F MAJESTIC REALTY LLC BK/PG 45350/310 PB/PL 879/124 20 UXBRIDGE ROAD PID 11-236-20

N/F REGAL REALTY ASSOCIATES LLC BK/PG 45350/308 PB/PL 879/124 14 UXBRIDGE ROAD PID 11-236-14

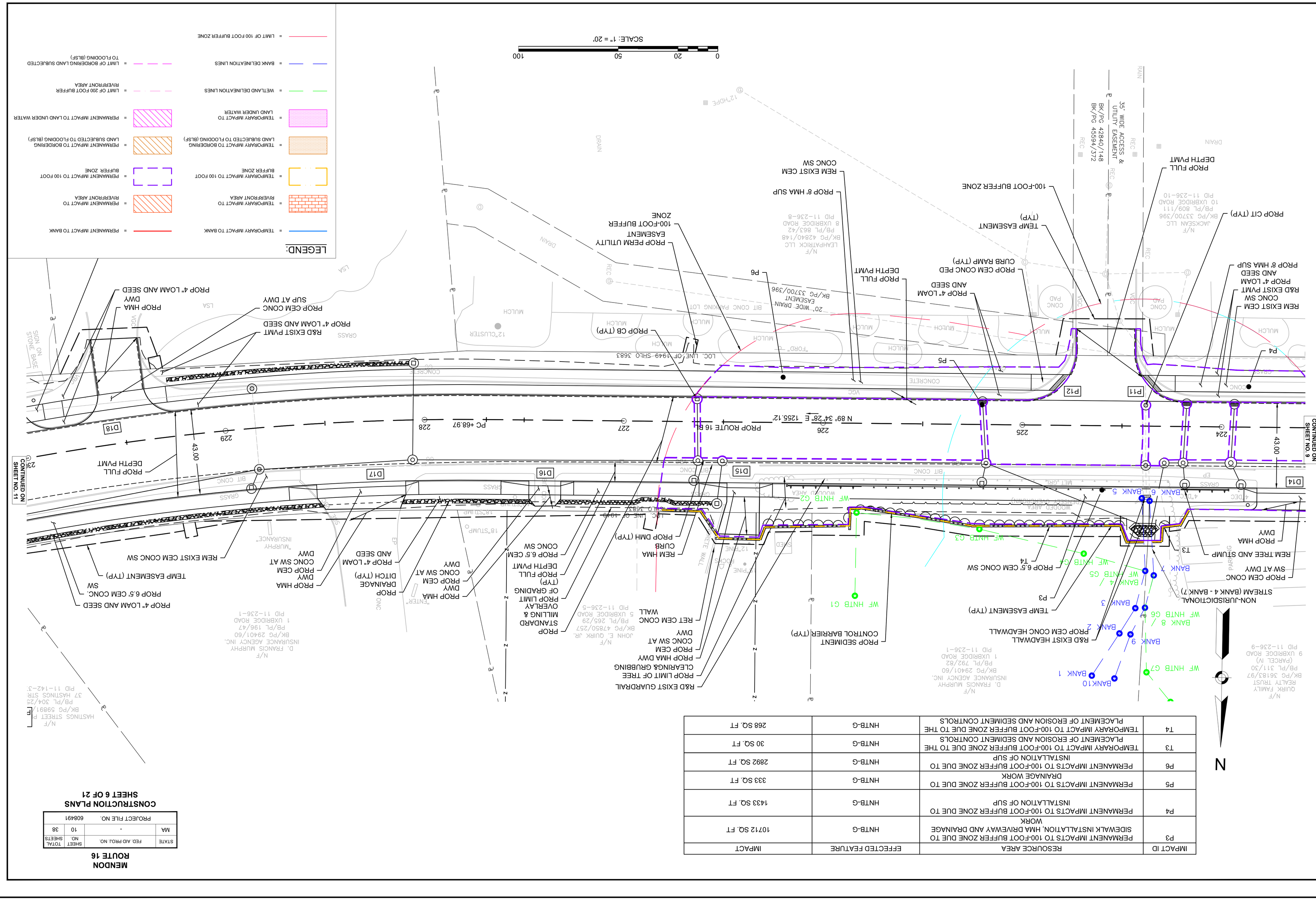
0 20 50 100

SCALE: 1" = 20'

LEGEND:

- = TEMPORARY IMPACT TO BANK
- = PERMANENT IMPACT TO BANK
- = TEMPORARY IMPACT TO RIVERFRONT AREA
- = PERMANENT IMPACT TO RIVERFRONT AREA
- = TEMPORARY IMPACT TO 100 FOOT BUFFER ZONE
- = PERMANENT IMPACT TO 100 FOOT BUFFER ZONE
- = TEMPORARY IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = PERMANENT IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = TEMPORARY IMPACT TO LAND UNDER WATER
- = PERMANENT IMPACT TO LAND UNDER WATER
- = WETLAND DELINEATION LINES
- = LIMIT OF 200 FOOT BUFFER RIVERFRONT AREA
- = BANK DELINEATION LINES
- = LIMIT OF BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = LIMIT OF 100 FOOT BUFFER ZONE

Proposal No. 608491-131468
X00860 - 142



IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
P3	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO SIDEWALK INSTALLATION, HMA DRIVEWAY AND DRAINAGE WORK	HNTB-G	10712 SQ. FT
P4	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO INSTALLATION OF SUP	HNTB-G	1433 SQ. FT
P5	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO DRAINAGE WORK	HNTB-G	333 SQ. FT
P6	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO INSTALLATION OF SUP	HNTB-G	2892 SQ. FT
T3	TEMPORARY IMPACT TO 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-G	30 SQ. FT
T4	TEMPORARY IMPACT TO 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-G	268 SQ. FT

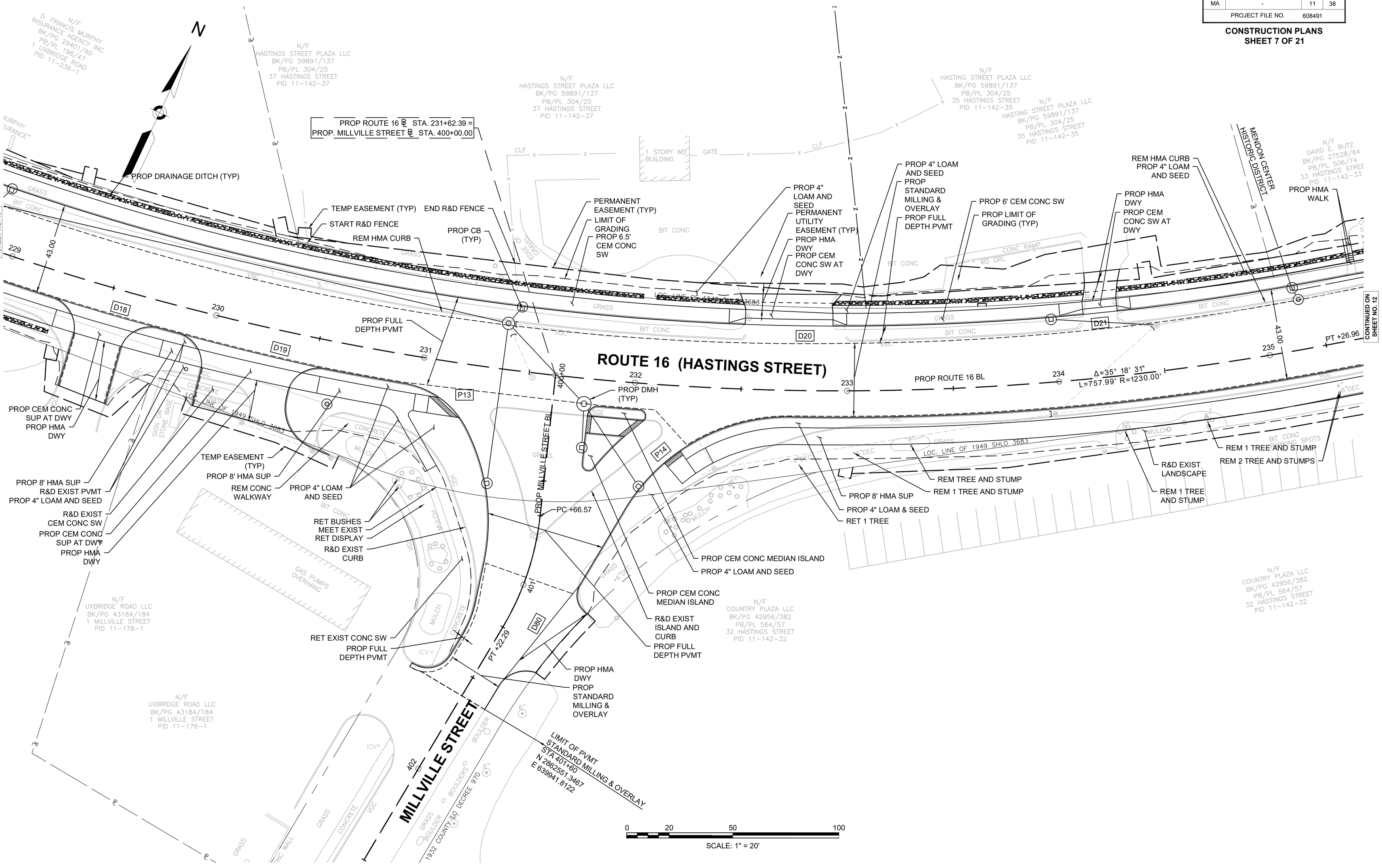
MENDON
ROUTE 16
CONSTRUCTION PLANS
SHEET 6 OF 21

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	38
PROJECT FILE NO.	608491		

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 7 OF 21



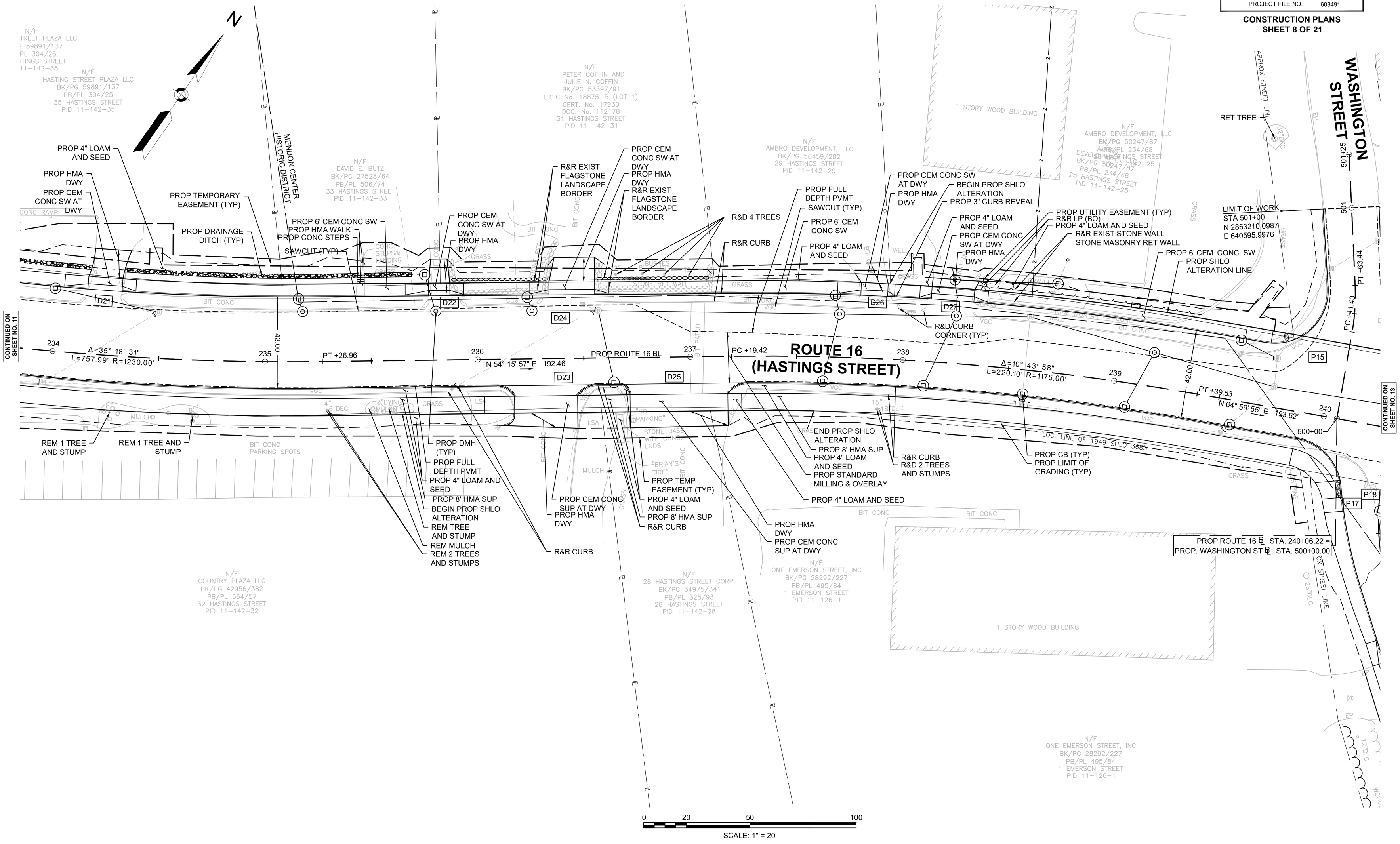
Proposal No. 608491-131468

A00869 - 144

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 8 OF 21



Proposal No. 608491-131468

A00660 - 145

FOR PROFILES SEE SHEET: 58 , 74 , 75 , 76

SCALE: 1" = 20'

0 20 50 100

CONSTRUCTION PLANS
SHEET 9 OF 21

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	13	38
PROJECT FILE NO. 608491			

MENDON
ROUTE 16

CONTINUED ON SHEET NO. 14

CONTINUED ON SHEET NO. 12

MAPLE STREET

PROP MAPLE ST BL

PROP ROUTE 16 BL

ROUTE 16 (HASTINGS STREET)

EMERSON STREET

PROF EMERSON ST BL

PROP WASHINGTON ST BL

WASHINGTON STREET

MENDON Ct HISTORIC DISTRICT

LIMIT OF WORK STA 703+10 N 2863046.9008 E 640965.5982

LIMIT OF WORK STA 601+86 N 2863002.8272 E 640796.7156

LIMIT OF WORK STA 501+00 N 2863210.0987 E 640595.9976

PROP ROUTE 16 BL STA. 240+06.22 = PROP. WASHINGTON ST BL STA. 500+00.00

PROP ROUTE 16 BL STA. 240+31.99 = PROP EMERSON STREET BL STA. 600+00.00

PROP ROUTE 16 BL STA. 242+54.52 = PROP MAPLE STREET BL STA. 700+00.00

PC +42.41
PT +71.63
PC +22.88
PT +80.14
PC +33.14
PT +39.53
PC +41.43
PT +63.44
PC +128.7
PT +51.18
PC 80.11
PT +02.46

N 64° 59' 55" E 193.62'
42.00
34.00

MEET EXIST,+86
PROP HMA CURB
R&D HMA CURB
PROP FULL DEPTH PVMT
PROP LIMIT OF TREE CLEARING AND GRUBBING
RET TREE
PROP 4" LOAM AND SEED
PROP TEMP EASEMENT (TYP)
PROP STANDARD MILLING AND OVERLAY
R&R MOUNUMENT
R&D EXIST PVMT
PROP 4" LOAM & SEED
RET TREE
PROP FULL DEPTH PVMT
RET
PROP 8' HMA SUP
R&R CURB
PROP CEM CONC MEDIAN ISLAND
PROP 4" LOAM AND SEED
PROP HMA DWY
PROP CEM CONC SHLD
PROP HMA WALKWAY
R&R EXIST STONE WALL
REM EXIST CONC WALKWAY
REM CONC RET WALL
PROP HMA DWY
PROP CEM CONC SW AT DWY
PROP FULL DEPTH PVMT
R&R CURB
PROP STANDARD MILLING AND OVERLAY
PROP 4" LOAM AND SEED
PROP CEM CONC SW AT DWY
PROP HMA DWY
TEMP EASEMENT (TYP)
SAWCUT (TYP)
R&D GRAN CURB
PROP 6.5' CEM CONC SW
REM STUMP
REM HEDGES
PROP PERM UTILITY EASEMENT (TYP)
R&R CURB
REM TREE AND STUMP
REM EXIST CONC STEPS
PROP CONC STEPS
PROP 7' HMA SW
REM 1 TREE AND STUMP
RET 3 TREES
PROP SHLD ALTERATION LINE
R&R CURB
MEET EXIST,+00
RET TREE
PROP 8' HMA SUP
REM EXIST TREE AND STUMP
R&D CURB
PROP CEM CONC MEDIAN ISLAND
END PROP SHLD ALTERATION
PROP 8' HMA SUP
R&R CURB
PROP HMA DWY
R&D EXIST CEM CONC SW
BEGIN PROP HMA SW AT STA. 702+00
TEMP EASEMENT (TYP)
PROP PERM UTILITY EASEMENT (TYP)
R&D CONC CURB
R&D EXIST BUSH
REM TREE AND STUMP
R&D CURB CORNER
R&S
PROP 8' HMA SUP
R&R CURB
RET
PROP LIMIT OF GRADING (TYP)
PROP TREE CLEARING AND GRUBBING
REM TREE AND STUMP
PROP HMA
PROP CEM CONC SW AT DWY
PROP 4" LOAM AND SEED
R&R (BO) MEMORIAL
PROP TREE CLEARING AND GRUBBING
PROP FULL DEPTH PVMT
PROP HMA DWY
PROP CB (TYP)
PROP STANDARD MILLING AND OVERLAY
PROP 4" LOAM AND SEED
RET TREE
PROP CEM CONC PLAZA
RET STONE RET WALL
PROP LIMIT OF GRADING (TYP)
PROP FULL DEPTH PVMT
RET TREE
PROP CEM CONC MEDIAN ISLAND
PROP HMA DWY
PROP DMH (TYP)

P15 P16 P17 P18 P19 P20 P21 P22 P23 P24 P27 P28
D28 D29 D30 D31 D32 D33 D34
601 602
241 242 243 244 245
702 703 704 705 706

APPROX STREET LINE
APPROX S'STREET LINE
APPROX 'S' STREET LINE
PROP EDGE OF PAVEMENT
PROP CURB LINE
PROP EDGE OF SHLD
PROP EDGE OF WALK
PROP EDGE OF GRASS
PROP EDGE OF CONC
PROP EDGE OF BIT CONC
PROP EDGE OF GRAVEL
PROP EDGE OF STONE
PROP EDGE OF WOODED AREA
PROP EDGE OF BRUSH
PROP EDGE OF TREE
PROP EDGE OF RET WALL
PROP EDGE OF STONE WALL
PROP EDGE OF BRICK
PROP EDGE OF STEPS
PROP EDGE OF RAMP
PROP EDGE OF CONC SLOPE
PROP EDGE OF BIT CONC SLOPE
PROP EDGE OF GRAVEL SLOPE
PROP EDGE OF STONE SLOPE
PROP EDGE OF BRICK SLOPE
PROP EDGE OF STEPS SLOPE
PROP EDGE OF RAMP SLOPE
PROP EDGE OF CONC SLOPE
PROP EDGE OF BIT CONC SLOPE
PROP EDGE OF GRAVEL SLOPE
PROP EDGE OF STONE SLOPE
PROP EDGE OF BRICK SLOPE
PROP EDGE OF STEPS SLOPE
PROP EDGE OF RAMP SLOPE

N/F CARRIE A. RICE BK/PG 58593/208 36 MAPLE STREET PID 11-175-36

N/F JOHN A. COLLINS JR. AND SHARON A. COLLINS BK/PG 5983/110 38 MAPLE STREET PID 11-175-38

N/F GILMORE FAMILY IRREVOCABLE TRUST BK/PG 42165/292 23 HASTINGS STREET PID 11-142-23

N/F HACKENSON CORPORATION BK/PG 43873/254 21 HASTINGS STREET PID 11-142-21

N/F STEPHEN M. HACKENSON BK/PG 57271/275 19 HASTINGS STREET PID 11-142-19

N/F MENDON HISTORICAL SOCIETY OF MENDON BK/PG 57205/276 17 HASTINGS STREET PID 11-142-17

N/F MCKENSON CORPORATION BK/PG 8126/6 422/96 17 MAPLE STREET PID 11-142-14

N/F TEODORE L. CARLSON BK/PG 10137/135 23 MAPLE STREET PID 11-175-23

N/F JOHN A. COLLINS JR. AND SHARON A. COLLINS BK/PG 5983/110 38 MAPLE STREET PID 11-175-38

N/F 2 STORY WD BUILDING

N/F 1 STORY WD BUILDING

GRANITE BLOCKS

2 STORY WD BUILDING # 17 MAPLE STREET

LOC. LINE OF 1949 SHLO 568'

LOC. LINE OF 1949 SHLO 568'

REC. 15"VC-DRAIN

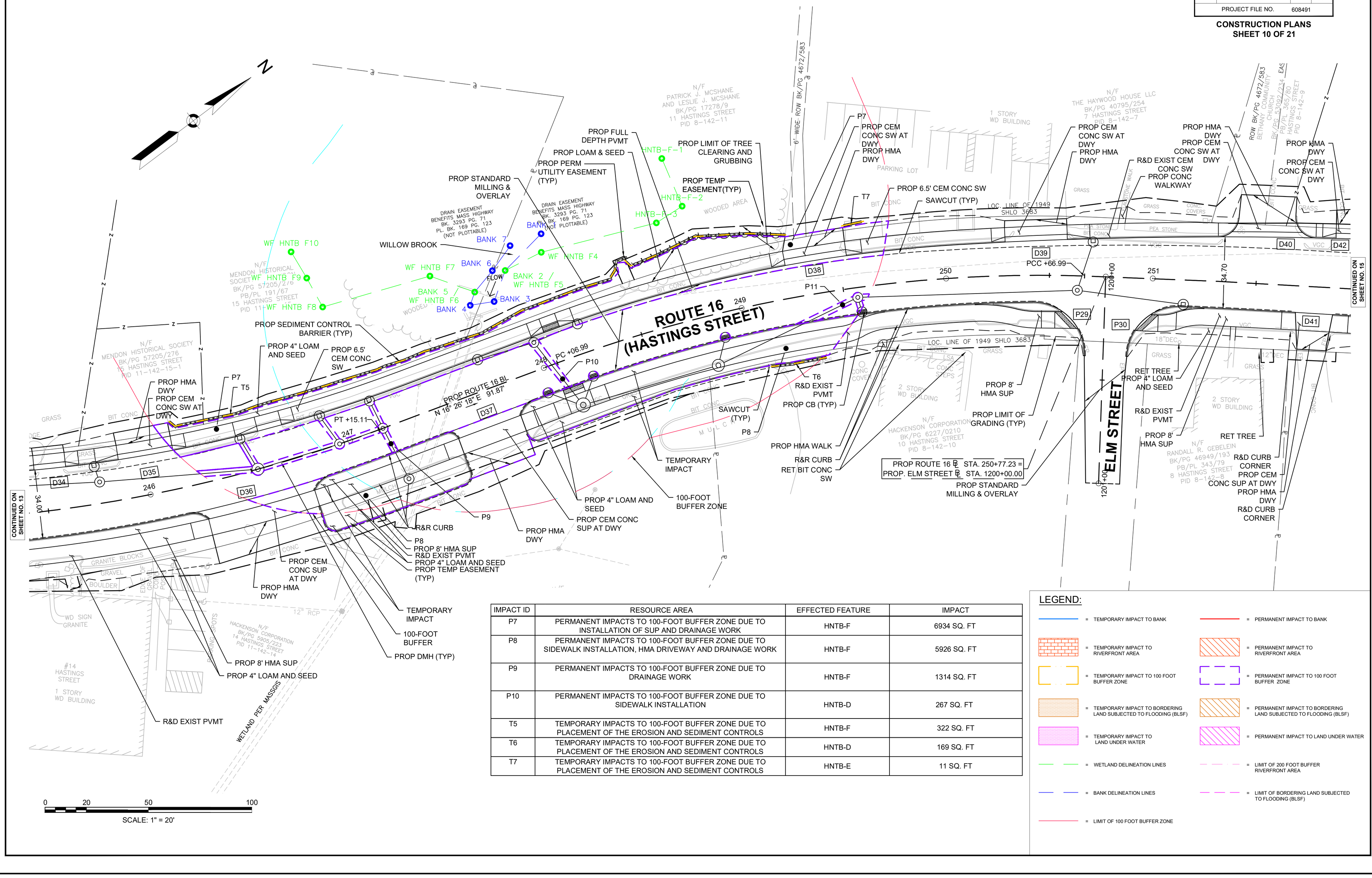
Proposal No. 608491-131468

A08060 - 146

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	14	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 10 OF 21



IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
P7	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO INSTALLATION OF SUP AND DRAINAGE WORK	HNTB-F	6934 SQ. FT
P8	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO SIDEWALK INSTALLATION, HMA DRIVEWAY AND DRAINAGE WORK	HNTB-F	5926 SQ. FT
P9	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO DRAINAGE WORK	HNTB-F	1314 SQ. FT
P10	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO SIDEWALK INSTALLATION	HNTB-D	267 SQ. FT
T5	TEMPORARY IMPACTS TO 100-FOOT BUFFER ZONE DUE TO PLACEMENT OF THE EROSION AND SEDIMENT CONTROLS	HNTB-F	322 SQ. FT
T6	TEMPORARY IMPACTS TO 100-FOOT BUFFER ZONE DUE TO PLACEMENT OF THE EROSION AND SEDIMENT CONTROLS	HNTB-D	169 SQ. FT
T7	TEMPORARY IMPACTS TO 100-FOOT BUFFER ZONE DUE TO PLACEMENT OF THE EROSION AND SEDIMENT CONTROLS	HNTB-E	11 SQ. FT

LEGEND:

- = TEMPORARY IMPACT TO BANK
- = PERMANENT IMPACT TO BANK
- = TEMPORARY IMPACT TO RIVERFRONT AREA
- = PERMANENT IMPACT TO RIVERFRONT AREA
- = TEMPORARY IMPACT TO 100 FOOT BUFFER ZONE
- = PERMANENT IMPACT TO 100 FOOT BUFFER ZONE
- = TEMPORARY IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = PERMANENT IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = TEMPORARY IMPACT TO LAND UNDER WATER
- = PERMANENT IMPACT TO LAND UNDER WATER
- = WETLAND DELINEATION LINES
- = LIMIT OF 200 FOOT BUFFER RIVERFRONT AREA
- = BANK DELINEATION LINES
- = LIMIT OF BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = LIMIT OF 100 FOOT BUFFER ZONE

Proposal No. 608491-131468

A00860 - 147

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	15	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 11 OF 21

Proposal No. 608491-131468

A008660 - 148

INSET A

SEE INSET A

LIMIT OF WORK
STA 803+10
N 2864551.2177
E 641430.0864

RET CEM CONC SW
PROP 5.5' CEM CONC SW
PROP SAWCUT
PROP STANDARD MILLING & OVERLAY
PROP FULL DEPTH PVMT
PROP HMA DWY
PROP SAWCUT
R&R EXIST STONE WALL
PROP STONE MASONRY RET WALL
TEMP EASEMENT (TYP)
PROP LIMIT OF GRADING (TYP)
R&R CURB
PROP 4" LOAM AND SEED
SAWCUT (TYP)
R&D BIT CONC SW
PROP CEM CONC SW AT DWY
REM CONC STEPS
PROP CONC STEPS AND RAILING
PROP CB (TYP)
PROP DMH (TYP)
PROP LIMIT OF CEM CONC SW
PROP 8' HMA SUP
R&D CURB CORNER
R&D EXIST PVMT
PROP CEM CONC SUP AT DWY
MEET EXIST SW RET CURB
PROP 8' HMA SUP
R&D
SHRUBS
R&D EXIST CURB
R&R CURB CORNERS
PROP HMA DWY
R&R CURB CORNERS
PROP 4" LOAM AND SEED
PROP CEM CONC SUP AT DWY
PROP 8' HMA SUP
PROP TOWN LO ALTERATION LINE
PROP SHLO ALTERATION LINE
PROP LIMIT OF GRADING (TYP)
SAWCUT (TYP)
REM CONC RET WALL
PROP STANDARD MILLING & OVERLAY
REM TREE AND STUMP
R&D

N/F
BETHANY COMMUNITY CHURCH
BK/PG 53092/234
PB/PL 436/100
3 HASTINGS STREET
PID 8-142-3

N/F
BETHANY COMMUNITY CHURCH
BK/PG 53092/234
PB/PL 365/80
9 HASTINGS STREET
PID 8-142-9

ROW BK/PG 4672/583

EASEMENT

VERIZON NEW ENGLAND INC. AND MASSACHUSETTS ELECTRIC COMPANY EASEMENT
BK/PG 45482/60

MECOBA PROPERTIES, INC EASEMENT BK/PG 45159/266

N/F
HASTINGS PROPERTIES NOMINEE TRUST
BK/PG 22110/46
1 HASTINGS STREET
PID 8-142-1

N/F
FINO REALTY LLC
BK/PG 49514/22
1 NORTH AVENUE
PID 8-189-1

N/F
PAUL D. CROSBY
BK/PG 32753/142
6 HASTINGS STREET
PID 8-142-6

N/F
YOUNGSMA FAMILY LIVING TRUST
BK/PG 50698/373
4 HASTINGS STREET
PID 8-142-4

ROUTE 16
(HASTINGS STREET)

ROUTE 16
(MILFORD STREET)

NORTH AVENUE

MAIN STREET

PROP ROUTE 16 ℄ STA. 255+64.39 =
PROP. NORTH AVENUE ℄ STA. 800+00.00

PROP ROUTE 16 ℄ STA. 255+62.83 =
PROP MAIN STREET ℄ STA. 900+00.00

PROP NORTH STREET BL
PROP MAIN STREET BL

PC +23.80
PT +15.37
PC +17.93
PT +90.92

Δ=5° 23' 22"
L=188.12' R=2000.00'

40.26
39.00

CONTINUED ON SHEET NO. 39

CONTINUED ON SHEET NO. 41

0 20 50 100
SCALE: 1" = 20'

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	16	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 12 OF 21

ROUTE 16 (MILFORD STREET)

N

ACCESS EASEMENT

"MUDDY BROOK NORTH CONSERVATION AREA"
METACOMET LAND TRUST, INC
CONSERVATION RESTRICTION
SUBJECT TO ARTICLE 97
BK/PG 52480/277

N/F
TOWN OF MENDON
(CONSERVATION COMMISSION)
BK/PG 42983/63
20 MILFORD STREET
PID 9-177-20

N/F
TOWN OF MENDON
(CONSERVATION COMMISSION)
BK/PG 42983/63
6 MILFORD STREET
PID 8-177-6

N/F
FINO REALTY LLC
BK/PG 49514/22
PB/PL 830/80
1 NORTH AVENUE
PID 8-189-1

N/F
O REALTY LLC
'PG 49514/22
IORTH AVENUE
ID 8-189-1

R&R STONE BALANCE WALL
PROP FULL DEPTH PVMT SAWCUT (TYP)
TEMP EASEMENT (TYP)
PROP 4" LOAM AND SEED
PROP LIMIT OF GRADING (TYP)
PROP STANDARD MILL AND OVERLAY
RET EXIST STONE WALL
PROP TREE CLEARING AND GRUBBING
R&D EXIST STONE WALL
PROP 4" LOAM AND SEED
PROP TREE CLEARING AND GRUBBING
R&D
DOUBLE STONEWALL
"MAIN ST. NORTH AV.NEXT SIGNAL"
LOC. LINE OF 1949 SHLO 3683
GRASS
STONEWALL
SGE
EP
D48
D49
D50
D51
D52
D53
D54
D55
PROP ROUTE 16 BL
Δ=5° 23' 22"
L=188.42' R=2000.00'
39.00
258
PT +06.06
259
260
261
262
263
32.00
CONTINUED ON SHEET NO. 15
CONTINUED ON SHEET NO. 17
CONC
VGC
BIT CONC
LSA
HEDGE
GUIDE
STONE
1 STORY BUILDING
OH
GRAVEL
SPEED
CONC BLOCK RET WALL
DRAIN EASEMENT BENEFITS NEW HIGHWAY BK/PG 2267 PC. 340 PL. BK 2267 PC. 340 (NOT PLOTTABLE)
21"CON
SHRUBS
PROP HMA DWY
PROP CEM CONC SUP AT DWY
R&R CURB CORNER
PROP TREE CLEARING AND GRUBBING
PROP 8' HMA SUP
PROP 4" LOAM AND SEED
PROP CB (TYP)
PROP CEM CONC WALKWAY
RET CONC BLOCK WALL
PROP TEMP EASEMENT (TYP)
PROP CONC WALKWAY
PROP DMH (TYP)
RET EXIST WALL
PROP PERM UTILITY EASEMENT
PROP 8' HMA SUP
REM SHRUB
RET TREE
R&R CURB CORNER RET BD
PROP HMA DWY
PROP CEM CONC SUP AT DWY
PROP CEM CONC SUP AT DWY
N/F
LISA VINCENT TAYLOR
AND SHELLEY D. VINCENT IV
BK/PG 59810/52
15 MILFORD STREET
PID 8-177-15
N/F
WASSIM M. BECHARA
BK/PG 35327/24
3 MILFORD STREET
PID 8-177-3
N/F
PAUL P. GARAGLIANO AND
MARY F. GARAGLIANO
BK/PG 27716/269
5 MILFORD STREET
PID 8-177-5
N/F
KERI ANN LARAMIE
BK/PG 51628/322
7 MILFORD STREET
PID 8-177-7
N/F
STEVEN A. HANDLEY
BK/PG 63528/212
9 MILFORD STREET
PID 8-177-9
N/F
PETER G. COFFIN AND
JULIE A. COFFIN
BK/PG 53397/89
11 MILFORD STREET
PID 8-177-11
N/F
OPERTIES, LLC
43020/187
L 268/71
ORD STREET
8-177-1

0 20 50 100
SCALE: 1" = 20'

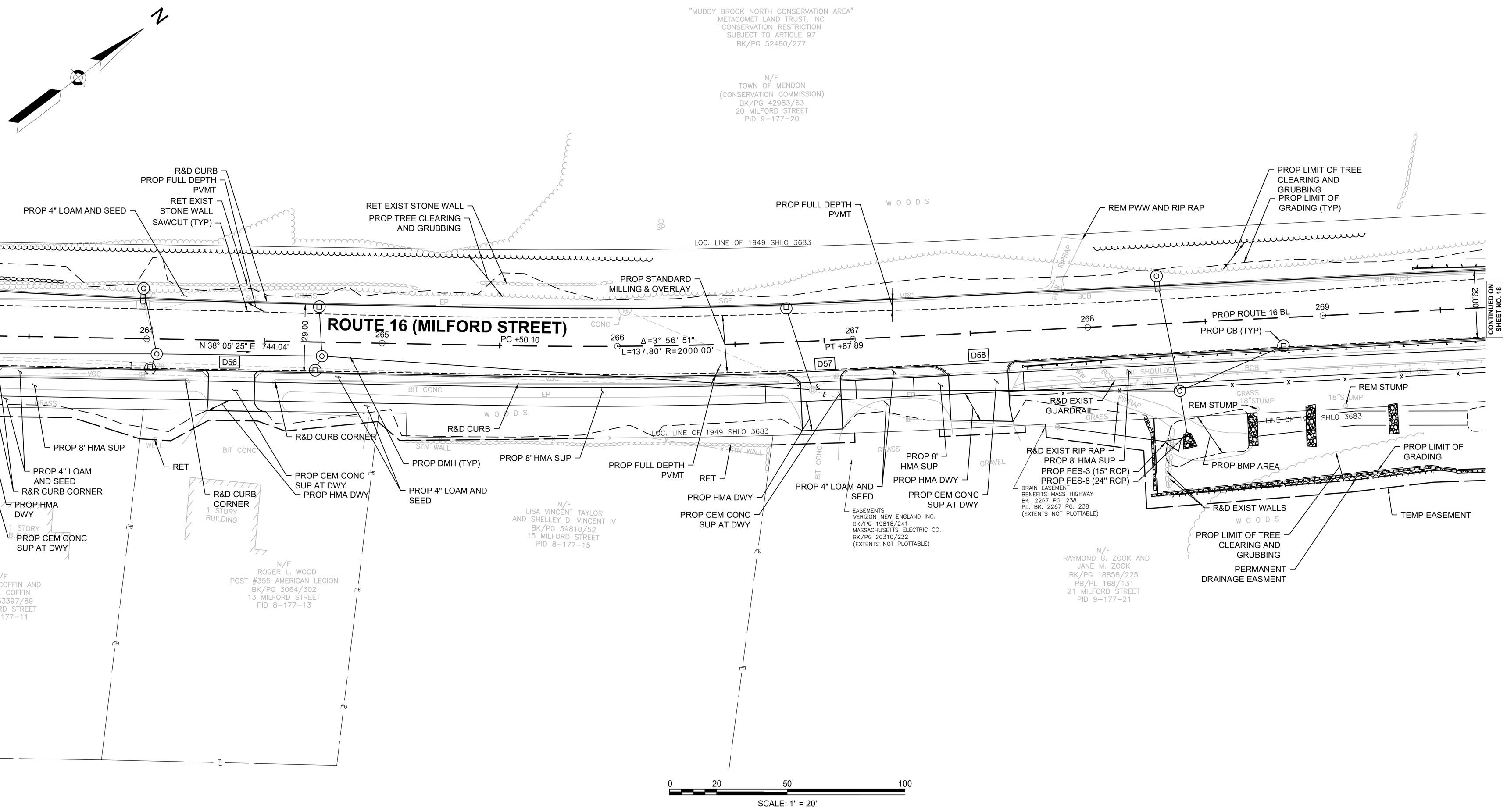
Proposal No. 608491-131468

A00860 - 149

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	38
PROJECT FILE NO.		608491	

CONSTRUCTION PLANS
SHEET 13 OF 21



Proposal No. 608491-131468

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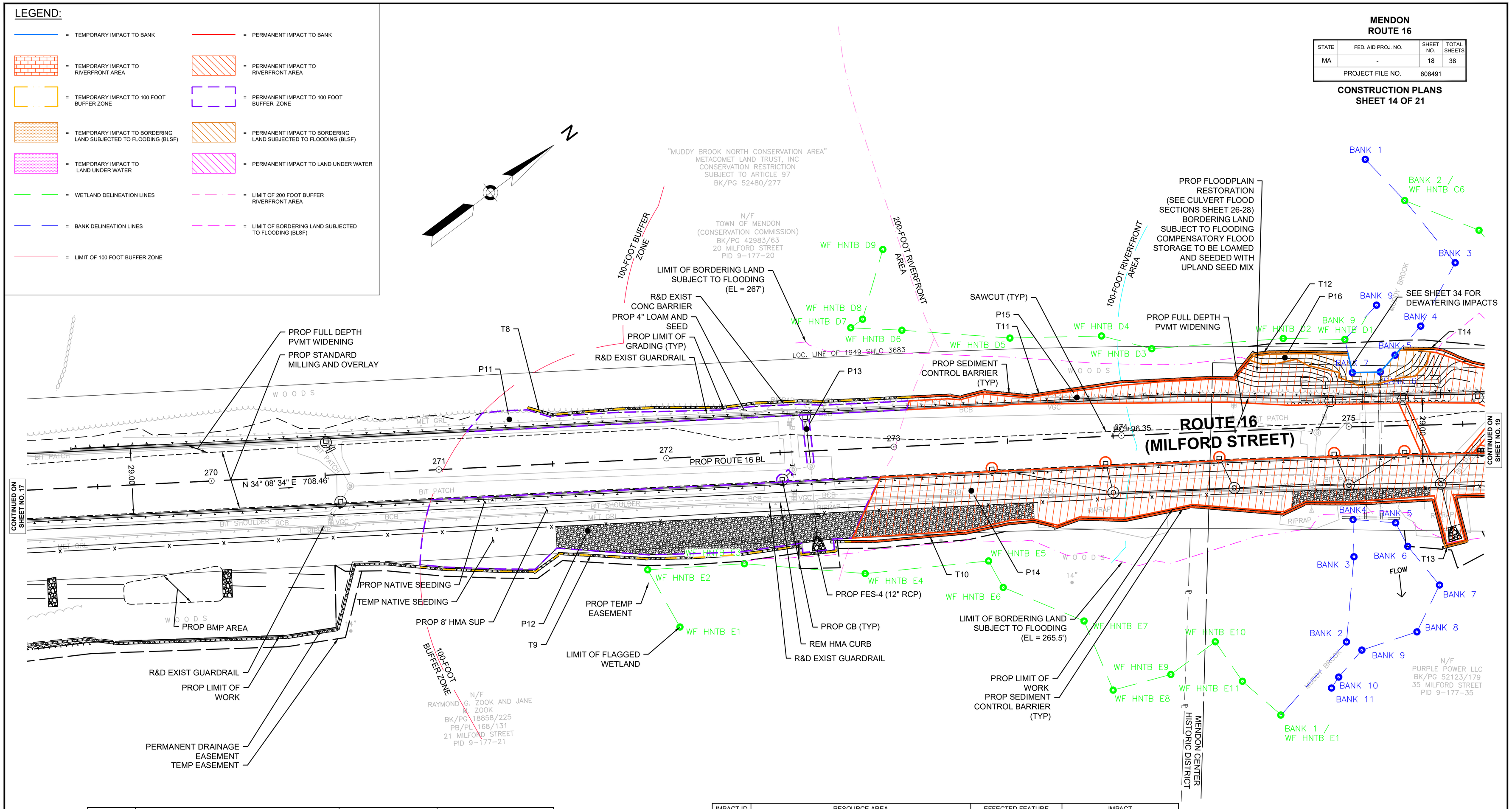
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	18	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 14 OF 21

LEGEND:

- = TEMPORARY IMPACT TO BANK
- = PERMANENT IMPACT TO BANK
- = TEMPORARY IMPACT TO RIVERFRONT AREA
- = PERMANENT IMPACT TO RIVERFRONT AREA
- = TEMPORARY IMPACT TO 100 FOOT BUFFER ZONE
- = PERMANENT IMPACT TO 100 FOOT BUFFER ZONE
- = TEMPORARY IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = PERMANENT IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = TEMPORARY IMPACT TO LAND UNDER WATER
- = PERMANENT IMPACT TO LAND UNDER WATER
- = WETLAND DELINEATION LINES
- = LIMIT OF 200 FOOT BUFFER RIVERFRONT AREA
- = BANK DELINEATION LINES
- = LIMIT OF BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = LIMIT OF 100 FOOT BUFFER ZONE



IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
P11	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO INSTALLATION OF SUP, SIDEWALK INSTALLATION, RIP RAP INSTALLATION AND DRAINAGE WORK	HNTB-E	956 SQ. FT
P12	PERMANENT IMPACTS TO 100-FOOT BUFFER ZONE DUE TO DRAINAGE WORK	HNTB-D/E	5609 SQ. FT
P13	PERMANENT IMPACTS TO 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO SIDEWALK INSTALLATION AND DRAINAGE WORK	HNTB-E / MUDDY BROOK	67 SQ. FT
P14	PERMANENT IMPACTS TO 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO ROADWAY WIDENING AND CULVERT EXTENSION	HNTB-D / MUDDY BROOK	9182 SQ. FT
P15	PERMANENT IMPACTS TO 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO CULVERT EXTENSION AND DRAINAGE WORK	HNTB-D / MUDDY BROOK	5628 SQ. FT
P16	PERMANENT IMPACTS TO BORDERING LAND SUBJECT TO FLOODING, 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO CULVERT EXTENSION AND DRAINAGE WORK	HNTB-D / MUDDY BROOK	503 SQ. FT

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T8	TEMPORARY IMPACTS TO 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-D	169 SQ. FT
T9	TEMPORARY IMPACTS TO 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-E	201 SQ. FT
T10	TEMPORARY IMPACTS TO 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-E / MUDDY BROOK	277 SQ. FT
T11	TEMPORARY IMPACTS TO 200-FOOT RIVERFRONT AREA, AND 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-E / MUDDY BROOK	153 SQ. FT
T12	TEMPORARY IMPACTS TO 200-FOOT RIVERFRONT AREA, 100-FOOT BUFFER ZONE AND BORDERING LAND SUBJECT TO FLOODING DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-D / MUDDY BROOK	45 SQ. FT
T13	TEMPORARY IMPACTS TO 200-FOOT RIVERFRONT AREA, 100-FOOT BUFFER ZONE AND BORDERING LAND SUBJECT TO FLOODING DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-E / MUDDY BROOK	14 SQ. FT
T14	TEMPORARY IMPACTS TO 200-FOOT RIVERFRONT AREA, 100-FOOT BUFFER ZONE AND BORDERING LAND SUBJECT TO FLOODING DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-C&D / MUDDY BROOK	13 SQ. FT

0 20 50 100
SCALE: 1" = 20'

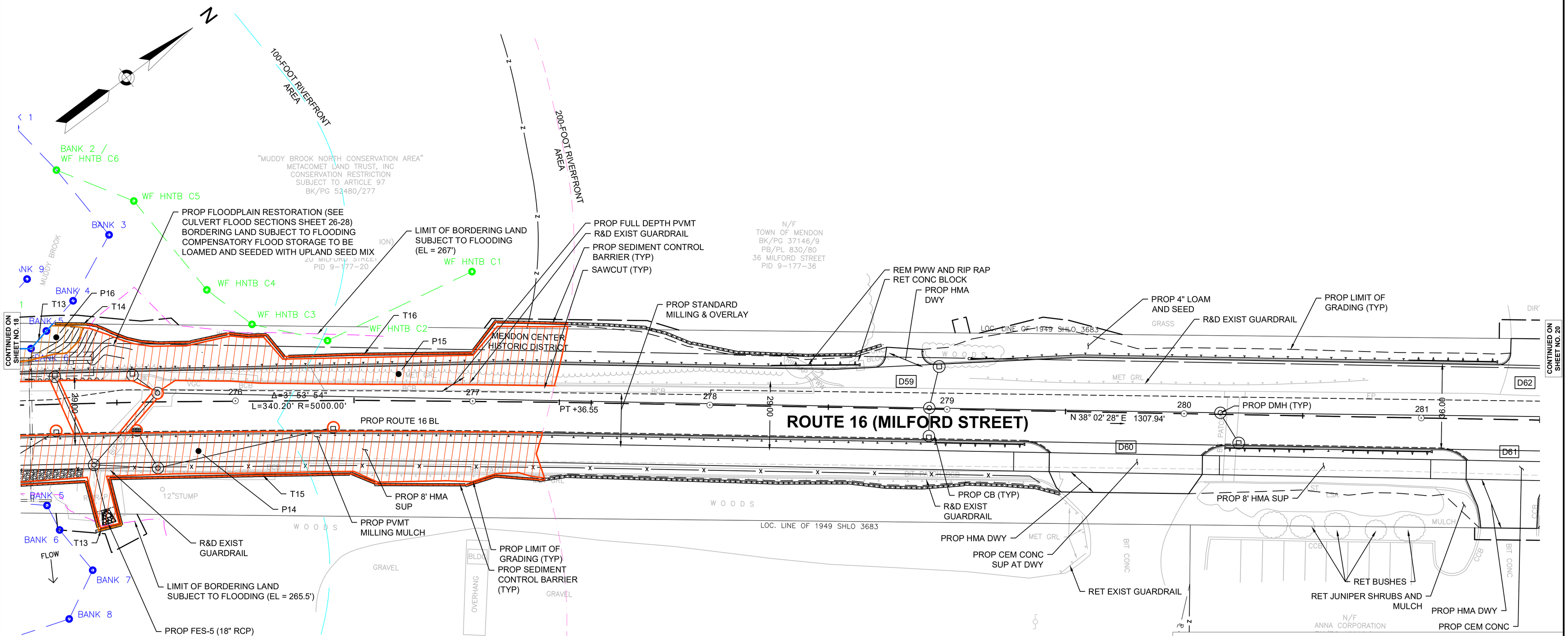
Proposal No. 608491-131468

A008601 - 151

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	38
PROJECT FILE NO.		608491	

CONSTRUCTION PLANS
SHEET 15 OF 21



IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
P14	PERMANENT IMPACTS TO 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO ROADWAY WIDENING AND CULVERT EXTENSION	HNTB-D / MUDDY BROOK	9182 SQ. FT
P15	PERMANENT IMPACTS TO 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO CULVERT EXTENSION AND DRAINAGE WORK	HNTB-D / MUDDY BROOK	5628 SQ. FT
P16	PERMANENT IMPACTS TO BORDERING LAND SUBJECT TO FLOODING, 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO CULVERT EXTENSION AND DRAINAGE WORK	HNTB-D / MUDDY BROOK	503 SQ. FT
T13	TEMPORARY IMPACTS TO 200-FOOT RIVERFRONT AREA, 100-FOOT BUFFER ZONE AND BORDERING LAND SUBJECT TO FLOODING DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-E / MUDDY BROOK	14 SQ. FT
T14	TEMPORARY IMPACTS TO 200-FOOT RIVERFRONT AREA, 100-FOOT BUFFER ZONE AND BORDERING LAND SUBJECT TO FLOODING DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-C&D / MUDDY BROOK	13 SQ. FT
T15	TEMPORARY IMPACTS TO 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-C / MUDDY BROOK	205 SQ. FT
T16	TEMPORARY IMPACTS TO 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE DUE TO THE PLACEMENT OF EROSION AND SEDIMENT CONTROLS	HNTB-C&D / MUDDY BROOK	216 SQ. FT

LEGEND:

- = TEMPORARY IMPACT TO BANK
- = PERMANENT IMPACT TO BANK
- = TEMPORARY IMPACT TO RIVERFRONT AREA
- = PERMANENT IMPACT TO RIVERFRONT AREA
- = TEMPORARY IMPACT TO 100 FOOT BUFFER ZONE
- = PERMANENT IMPACT TO 100 FOOT BUFFER ZONE
- = TEMPORARY IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = PERMANENT IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = TEMPORARY IMPACT TO LAND UNDER WATER
- = PERMANENT IMPACT TO LAND UNDER WATER
- = WETLAND DELINEATION LINES
- = LIMIT OF 200 FOOT BUFFER RIVERFRONT AREA
- = BANK DELINEATION LINES
- = LIMIT OF BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = LIMIT OF 100 FOOT BUFFER ZONE

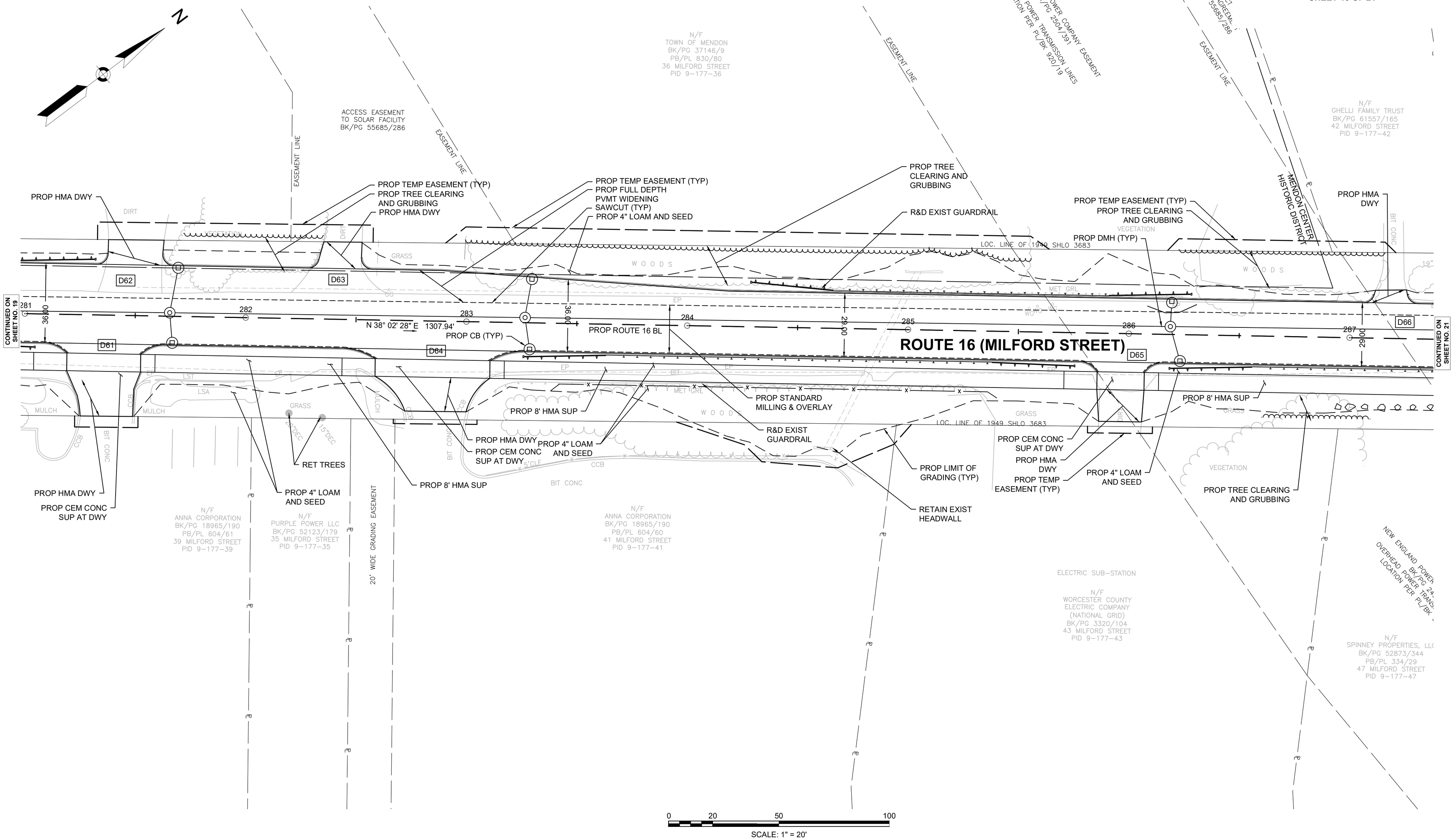
Proposal No. 608491-131468
A008691 - 152

HIGHWAY GUARD DETAILS

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	20	38
PROJECT FILE NO.		608491	

CONSTRUCTION PLANS
SHEET 16 OF 21



Proposal No. 608491-131468

A00860 - 153

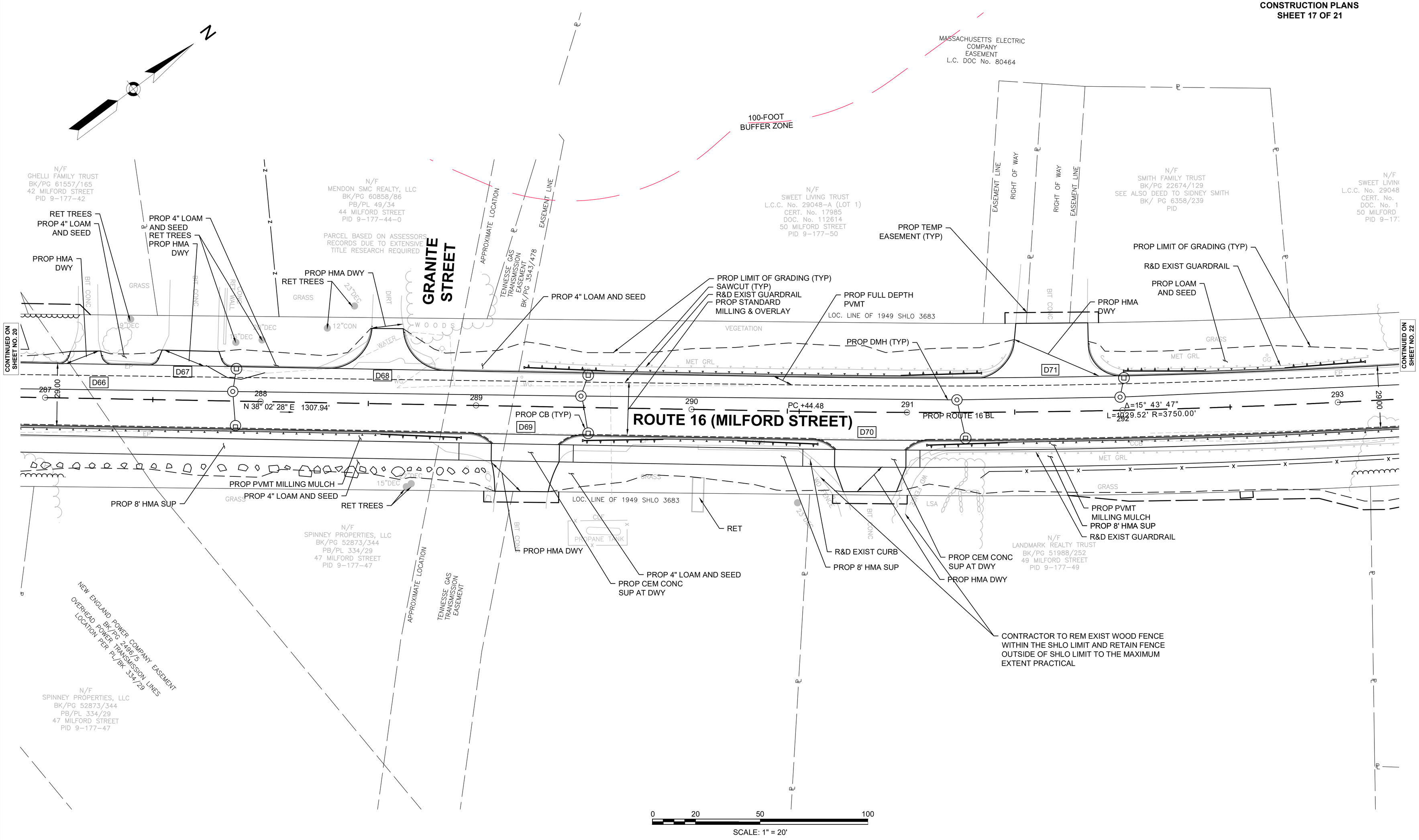
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	21	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 17 OF 21

Proposal No. 608491-131468

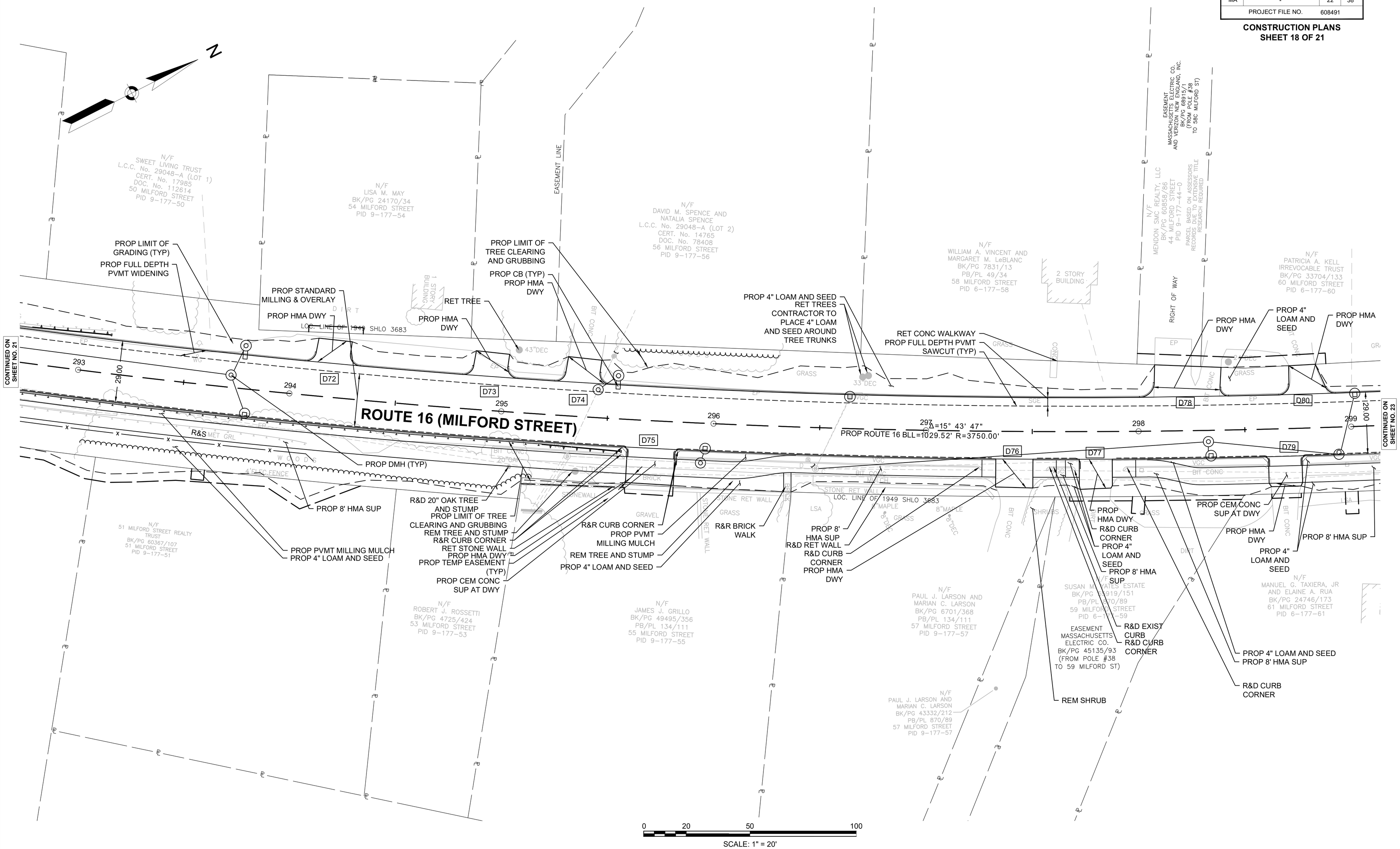
A00860 - 154



MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	22	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 18 OF 21

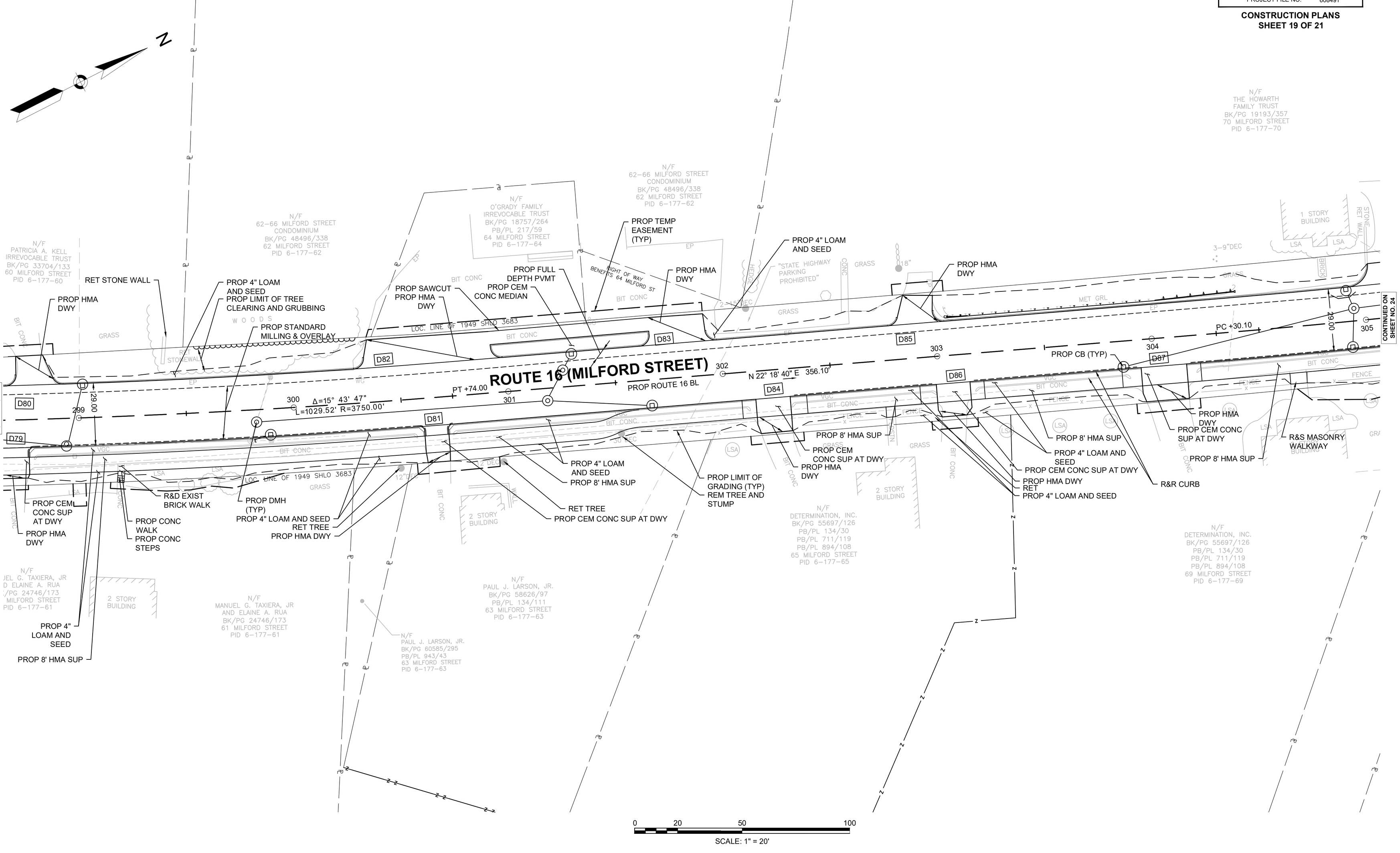


Proposal No. 608491-131468
A008660 - 155

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	23	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 19 OF 21



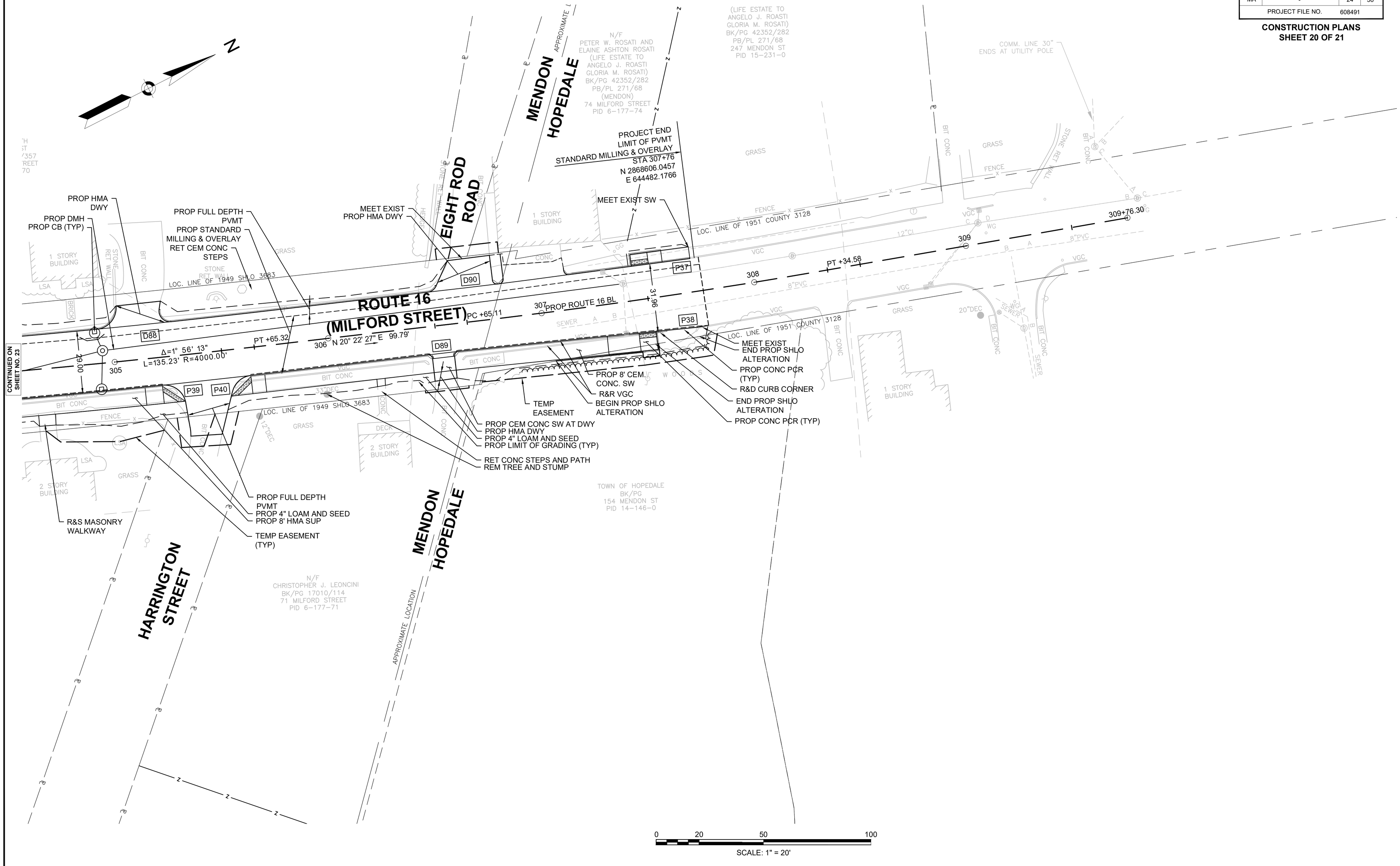
Proposal No. 608491-131468

A00869 - 156

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	24	38
PROJECT FILE NO.	608491		

CONSTRUCTION PLANS
SHEET 20 OF 21



Proposal No. 608491-131468

A00860 - 157

CONTINUED ON SHEET NO. 15

N

FOUNDERS PARK
BK/PG 1818/566
BK/PG 1844/373
1 MAIN STREET
PID 8-174-1
(SUBJECT TO ARTICLE 97)

PROP STANDARD MILLING AND OVERLAY

RET CURB

RET CONC STEPS

RET TREE

RET CEM CONC SW

RET TREE

RET STEPS

RET

RET GRAVEL

R&D GRAN PILE

PROP FULL DEPTH PVMT

SAWCUT (TYP)

RET TREE

RET TREE

PROP 4" LOAM AND SEED

RET TREE

RET TREE

LIMIT OF WORK
STA 903+62
N 2863992.6060
E 641805.2887

PROP MAIN STREET BL

MAIN STREET

PC +11.78

PT +01.98

903+68

901

902

903

LOC LINE

LOC LINE OF 1940

EP MET GRL

DB MART
1 STORY BUILDING

BK/PG 43020/107
PB/PL 268/71
1 MILFORD STREET
PID 8-177-1

1 STORY BUILDING

N/F
DAVID B. LOWELL AND
JANE E. LOWELL
BK/PG 9394/233
BK/PG 11691/381
4 MAIN STREET
PID 8-174-4

2 STORY BUILDING

N/F
LISA VINCENT TAYLOR
AND SHELLEY D. VINCENT IV
BK/PG 59810/52
15 MILFORD STREET
PID 8-177-15

54"DEC
17"DEC
50"DEC
48"DEC
60"
36"
36"
22"

GRASS
GRAVEL
CONC
VGC
WELL
LEA
ULT 69
SW

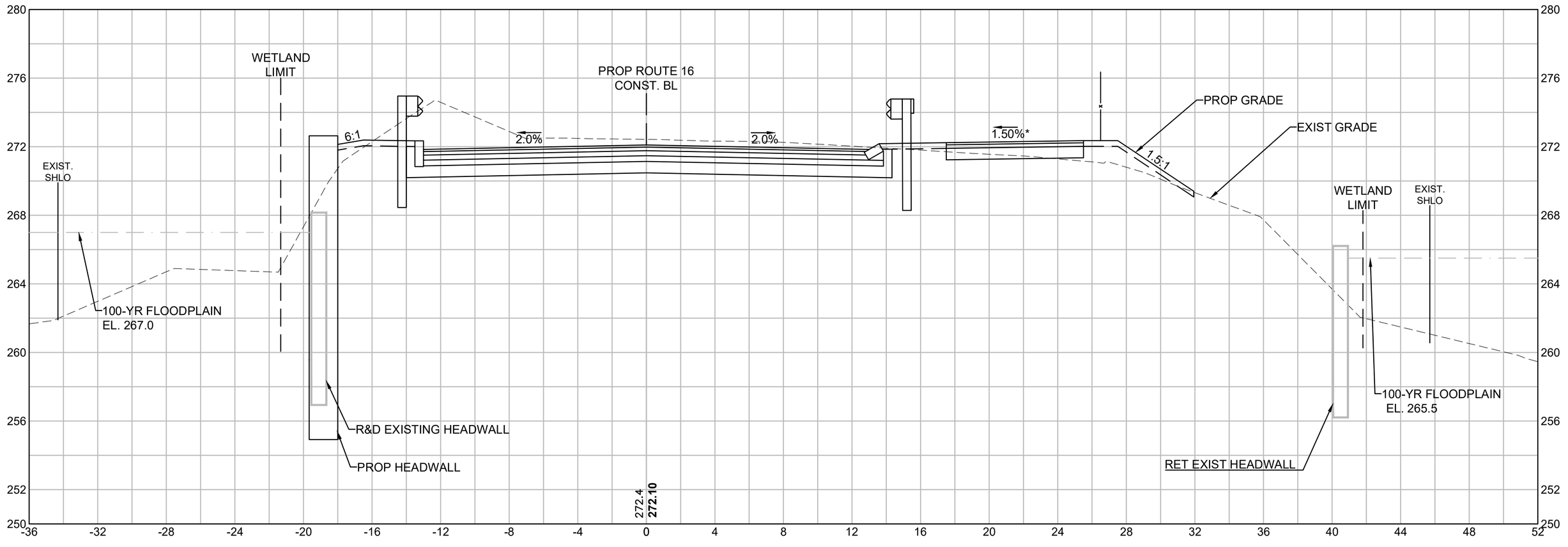
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SCALE: 1" = 20'

Proposal No. 608491-131468
A00860 - 158

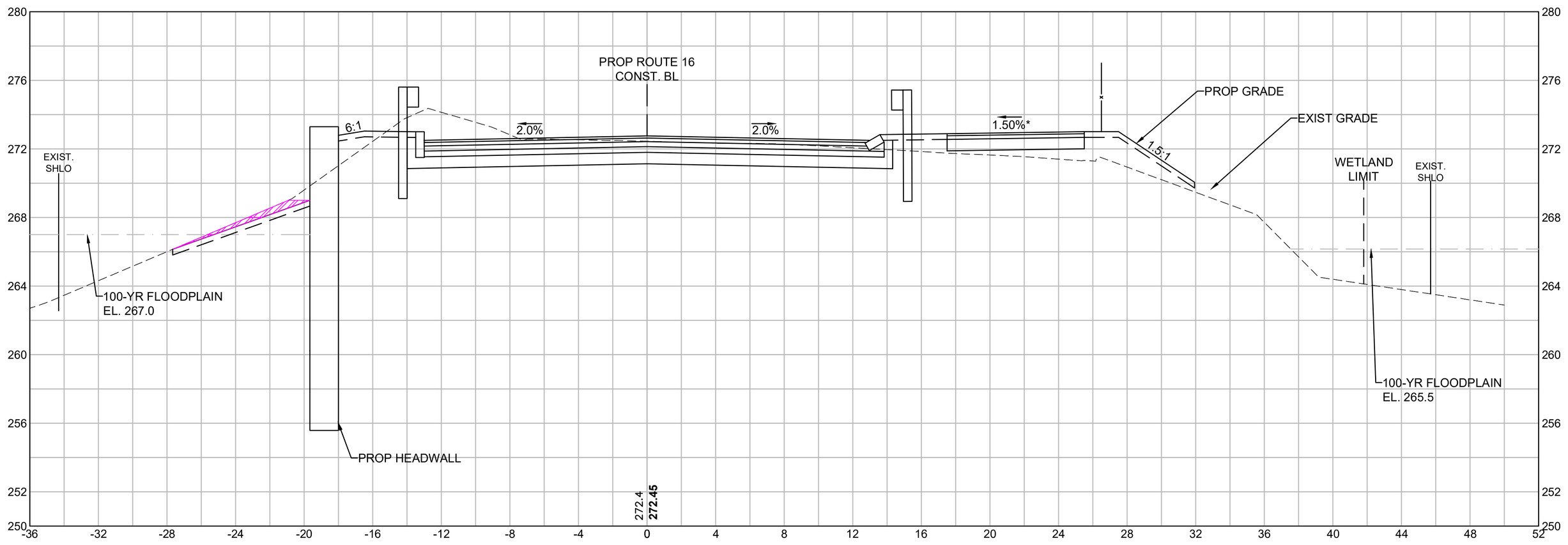
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	26	38
PROJECT FILE NO.	608491		

CULVERT FLOOD SECTIONS
SHEET 1 OF 3



275+00



274+90

LEGEND:

= FLOOD STORAGE LOSS

= FLOOD STORAGE GAIN

NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND SEEDED WITH UPLAND SEED MIX

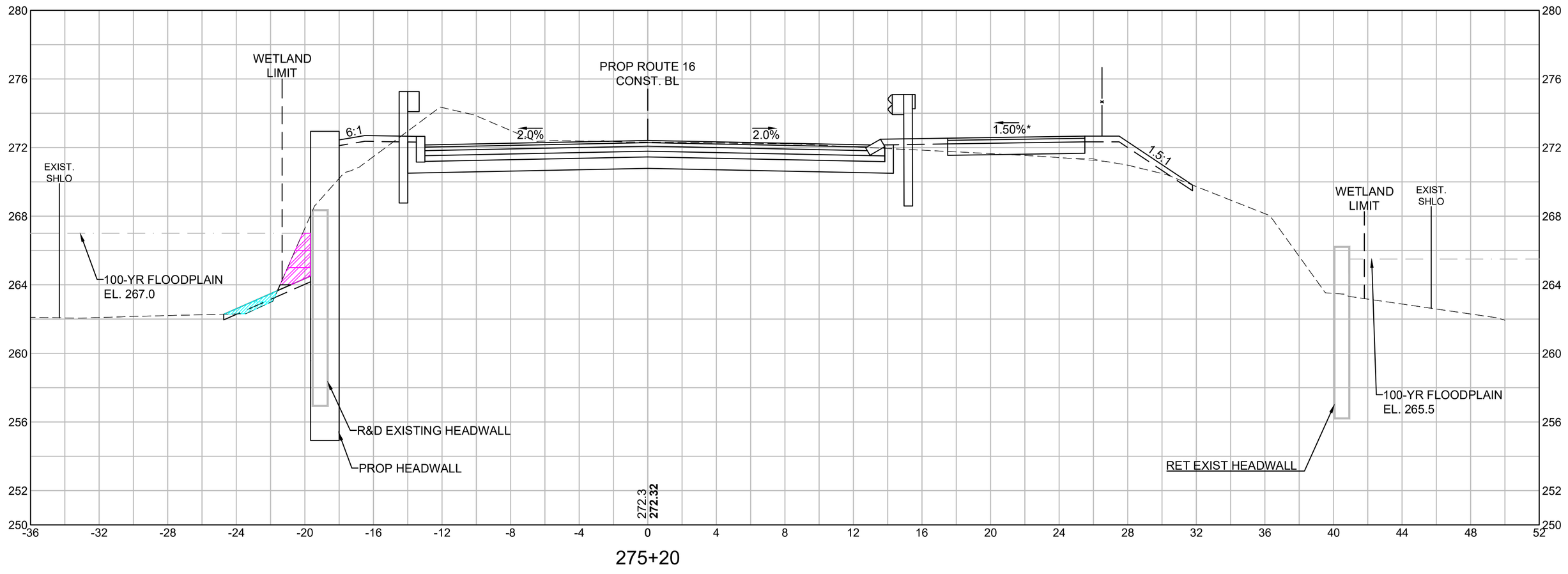
HOR. SCALE IN FEET
8 0 8 16
VER. SCALE IN FEET
8 0 8 16

Proposal No. 608491-131468
A008860 - 159

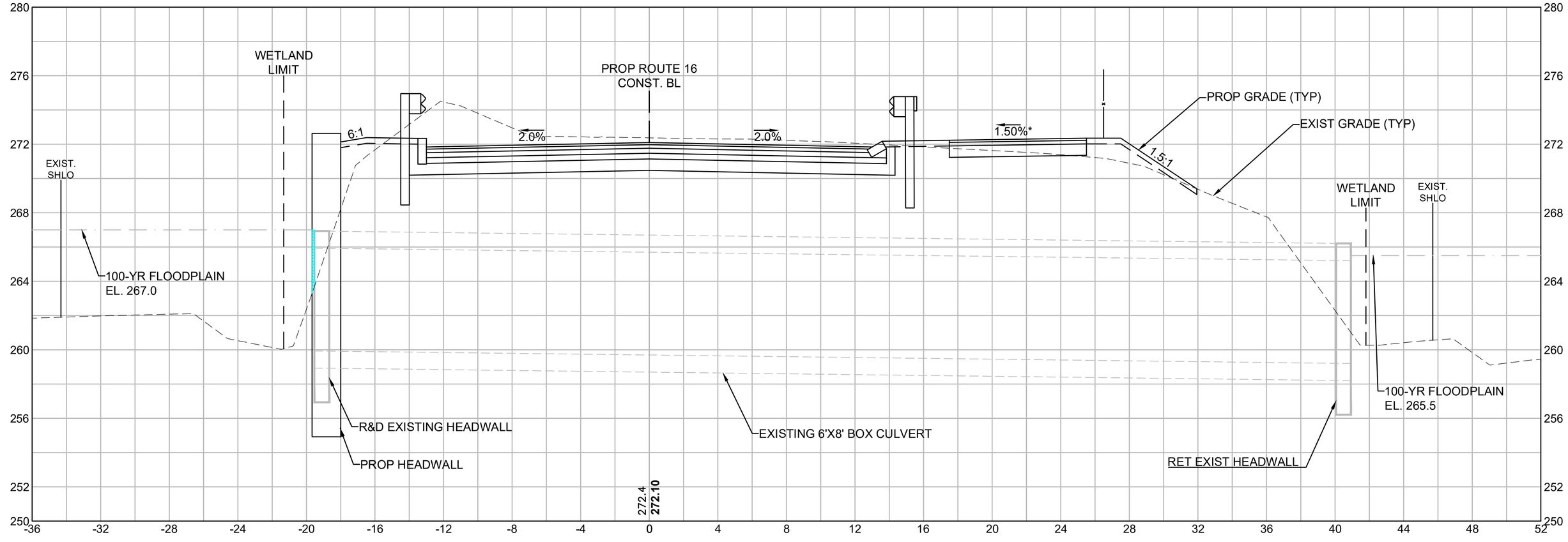
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA.	-	27	38
PROJECT FILE NO.	608491		

CULVERT FLOOD SECTIONS
SHEET 2 OF 3



275+20



275+12

LEGEND:

= FLOOD STORAGE LOSS

= FLOOD STORAGE GAIN

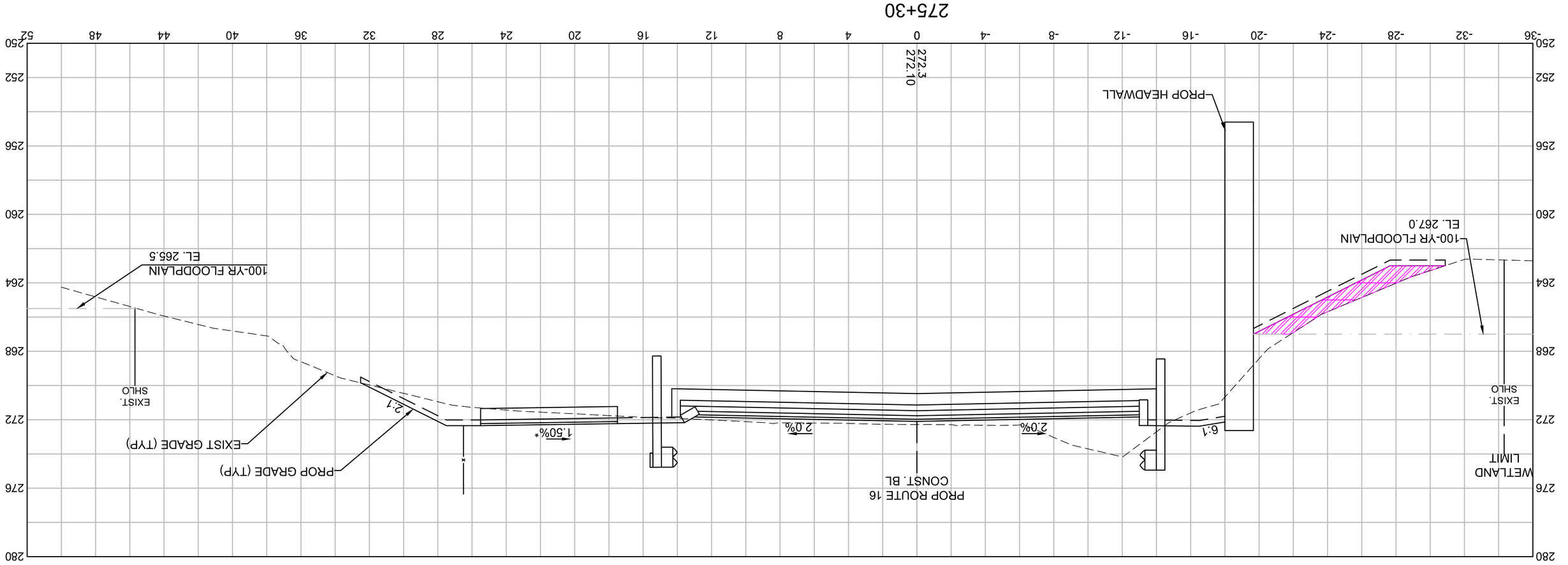
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8 0 8 16
VER. SCALE IN FEET

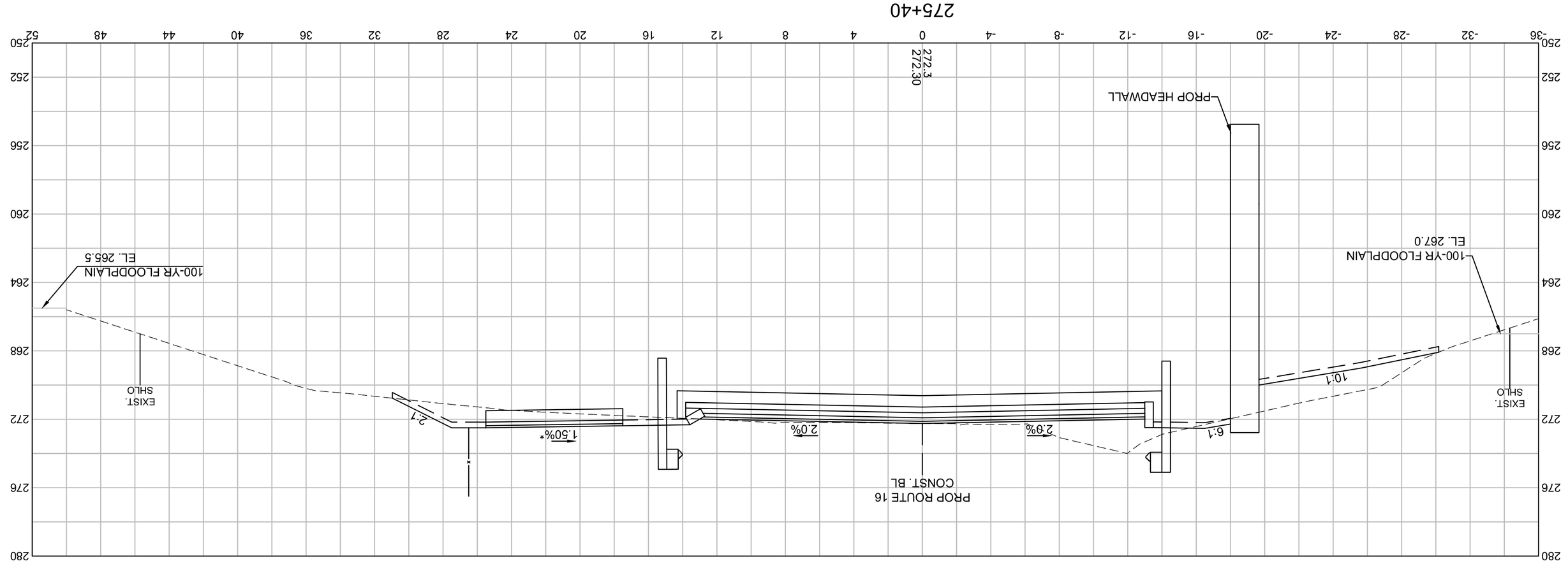
NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND SEEDED WITH UPLAND SEED MIX

Proposal No. 608491-131468
A00860 - 160

NOTE:
BORDERING LAND SUBJECT TO FLOODING
COMPENSATORY FLOOD STORAGE TO BE LOAMED AND
SEEDED WITH UPLAND SEED MIX

LEGEND:
= FLOOD STORAGE LOSS
= FLOOD STORAGE GAIN





CULVERT FLOOD SECTIONS
SHEET 3 OF 3

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	28	38
PROJECT FILE NO. 608491			

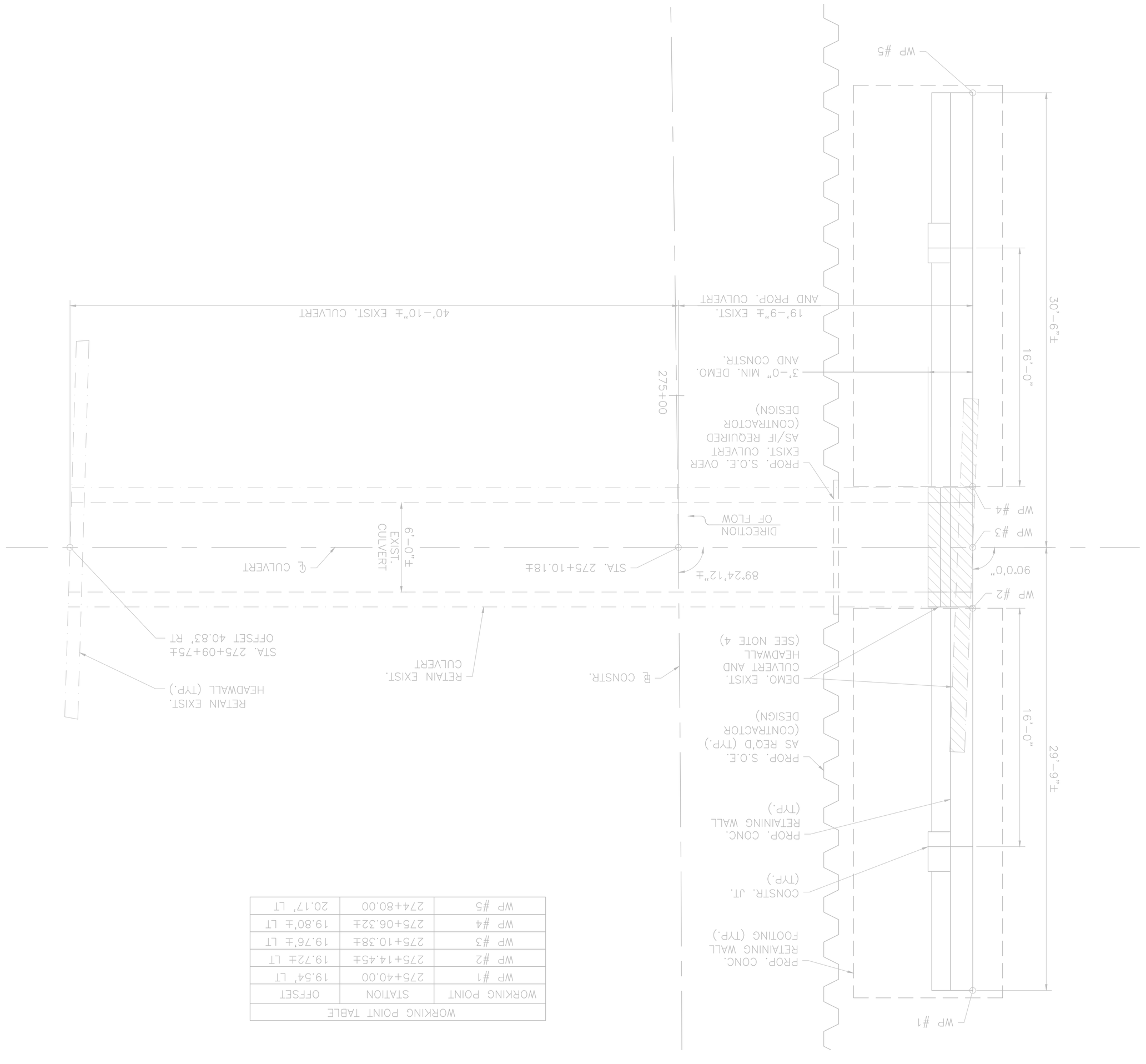
MENDON
ROUTE 16

A00860 - 191

Proposal No. 608491-13468

MUDDY BROOK CULVERT PLAN

SCALE 1" = 1'-0"



WORKING POINT TABLE		
WORKING POINT	STATION	OFFSET
WP #1	275+40.00	19.54' LT
WP #2	275+14.45±	19.72± LT
WP #3	275+10.38±	19.76'± LT
WP #4	275+06.32±	19.80'± LT
WP #5	274+80.00	20.17' LT

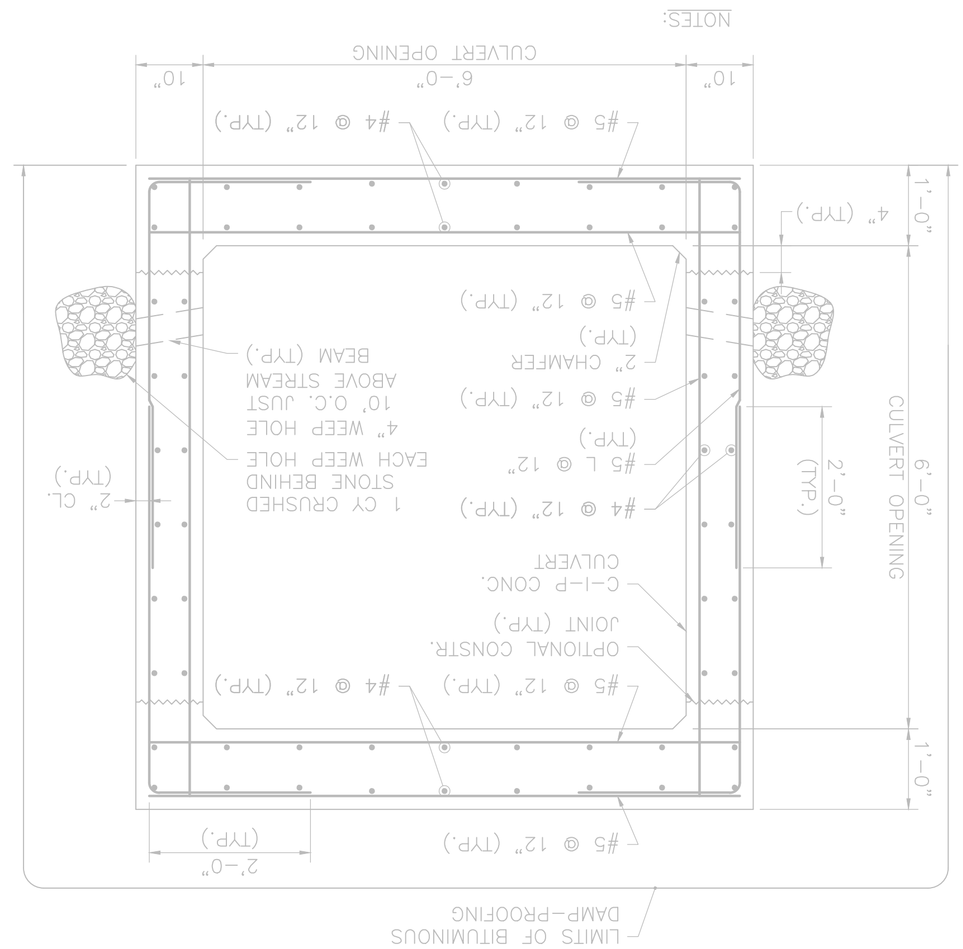
NOTES:

1. SUPPORT OF EXCAVATION (SHEETING, PILES, ETC.) SHALL BE CUT OFF A MINIMUM OF 2 FEET BELOW PROPOSED GRADE IF LEFT IN PLACE.
2. SEE SHEET 32 FOR RETAINING WALL DETAILS.
3. SEE SHEET 34 FOR CONTROL OF WATER DETAILS AND HYDRAULIC DATA.
4. LIMITS OF EXISTING RETAINING HEADWALLS AND ANY ASSOCIATED FOOTINGS BELOW GRADE ARE UNKNOWN. SUPPORT OF EXCAVATION AS SHOWN MAY REQUIRE MODIFICATION TO AVOID CONFLICTS WITH EXISTING STRUCTURE.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE AND PROTECTION OF UNDERGROUND UTILITIES AND/OR STRUCTURES IN THE AREA OF CONSTRUCTION.

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	29	38
PROJECT FILE NO. 608491			

CULVERT PLAN

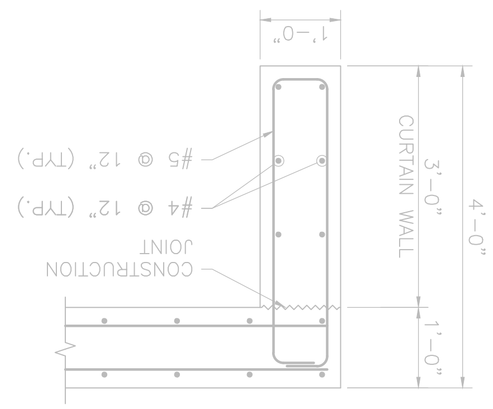


NOTES:

1. MAXIMUM FACTORED BEARING PRESSURE = 3 KSF.
2. FACTORED BEARING RESISTANCE = 6 KSF.

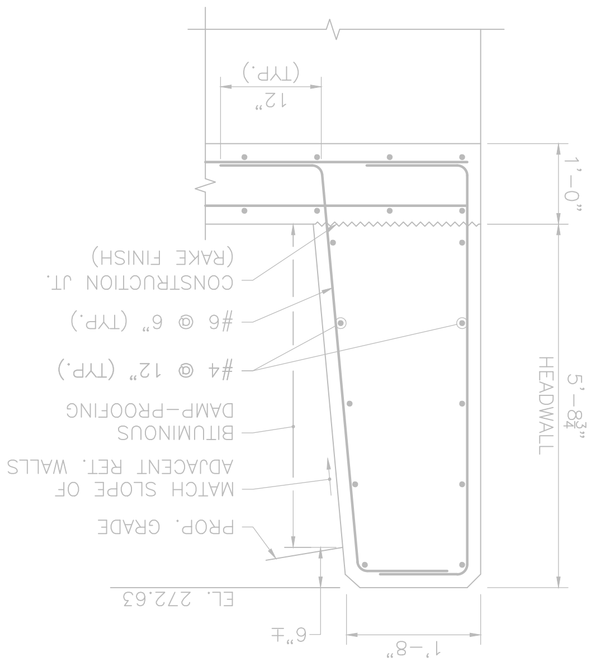
PROPOSED CULVERT SECTION

SCALE $\frac{3}{4}$" = 1'-0"



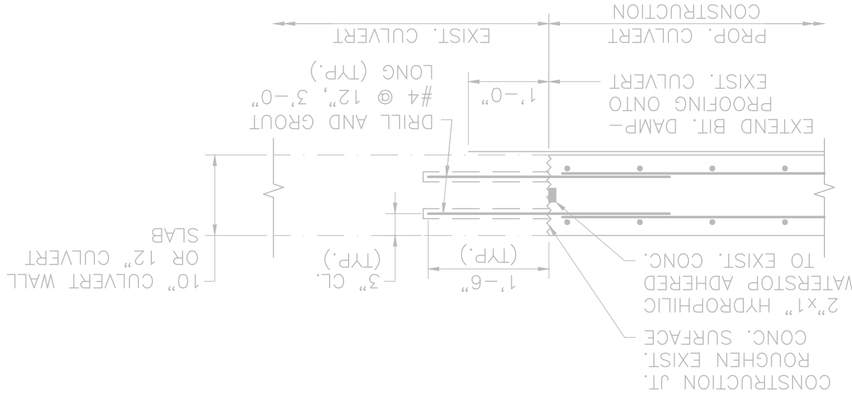
CURTAIN WALL DETAIL

SCALE $\frac{3}{4}$" = 1'-0"



HEADWALL DETAIL

SCALE $\frac{3}{4}$" = 1'-0"

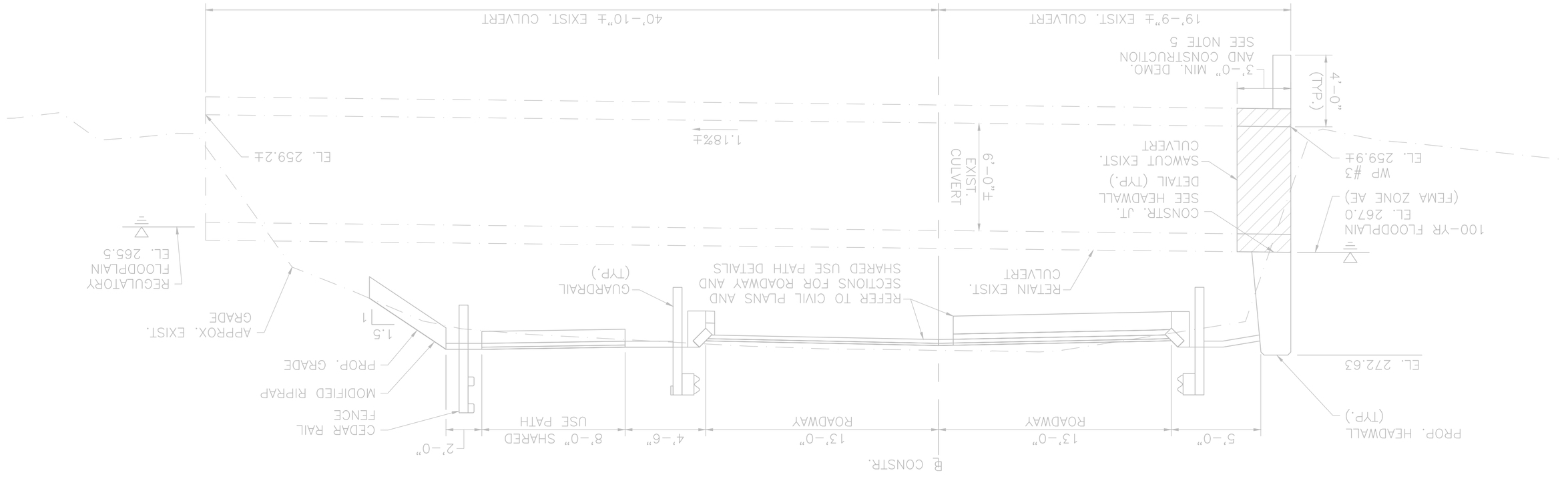


EXISTING CULVERT CONNECTION

SCALE $\frac{3}{4}$" = 1'-0"

NOTES:

1. ALL CONCRETE SHALL BE 4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE.
2. CULVERT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
3. TRANSVERSE REINFORCEMENT SHALL BE PLACED NORMAL TO THE CENTERLINE OF THE CULVERT.
4. DEMOLITION OF EXISTING CULVERT AT THE EAST END SHALL EXTEND A MINIMUM OF 3'-0" AS SHOWN. CULVERT DEMOLITION SHALL EXTEND TO SOUND CONCRETE SECTION BEYOND THE LIMITS OF CRACKING AND SPALLING TO THE EXISTING CULVERT.



MENDON
ROUTE 16

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MA	-	30	38
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CULVERT LONG. SECTION AND DETAILS

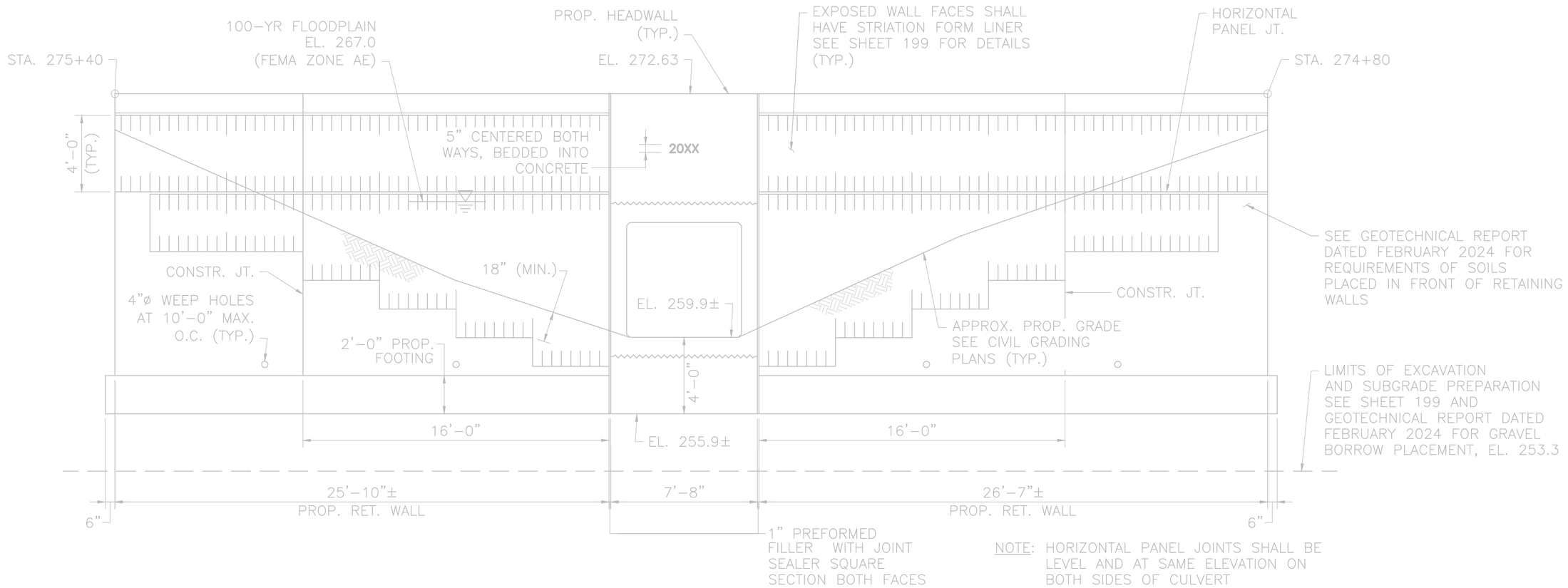
A08860 - 163

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MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	31	38
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CULVERT ELEVATIONS



MUDDY BROOK CULVERT WEST ELEVATION

SCALE $\frac{1}{4}$" = 2'-0"

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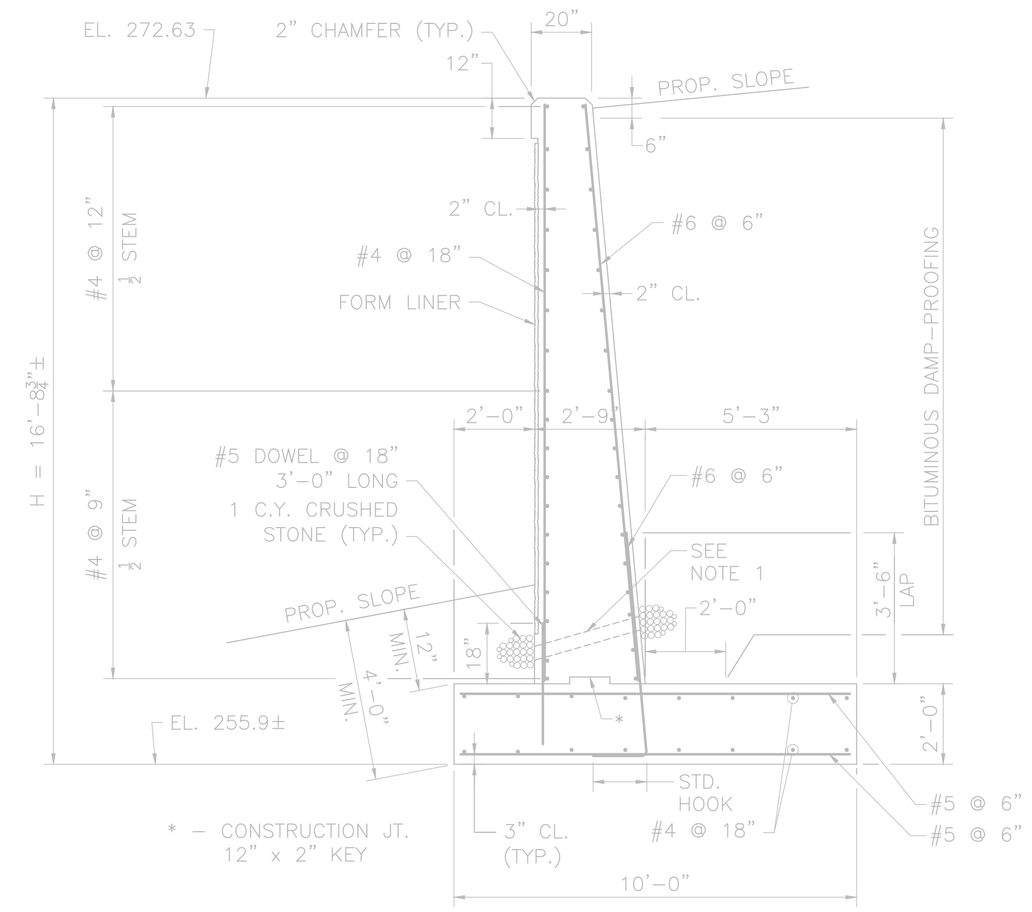
Proposal No. 608491-131468

A00860 - 165

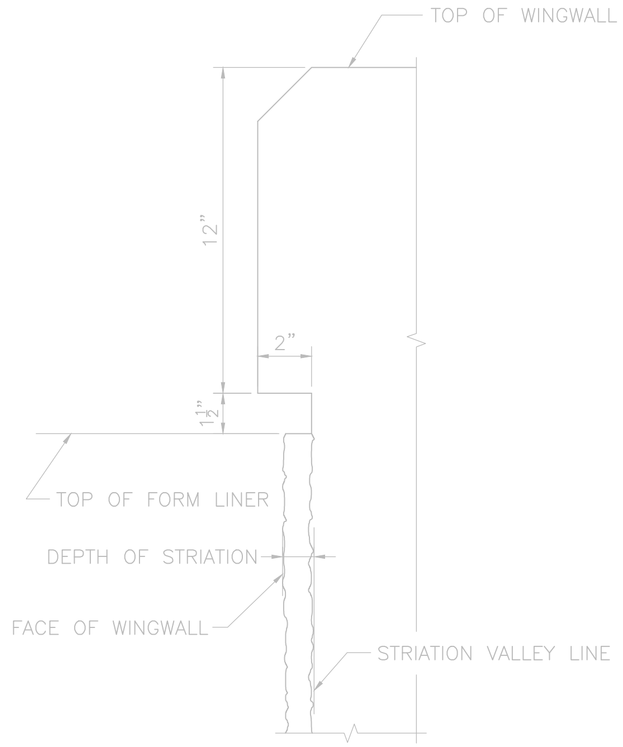
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	32	38
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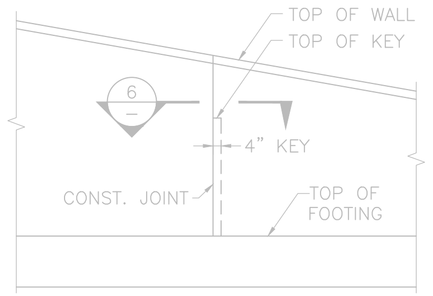
CULVERT RETAINING WALL DETAILS



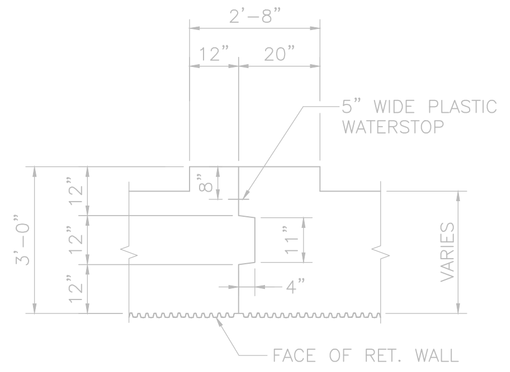
CULVERT RETAINING WALL SECTION
SCALE ⅜" = 1'-0"



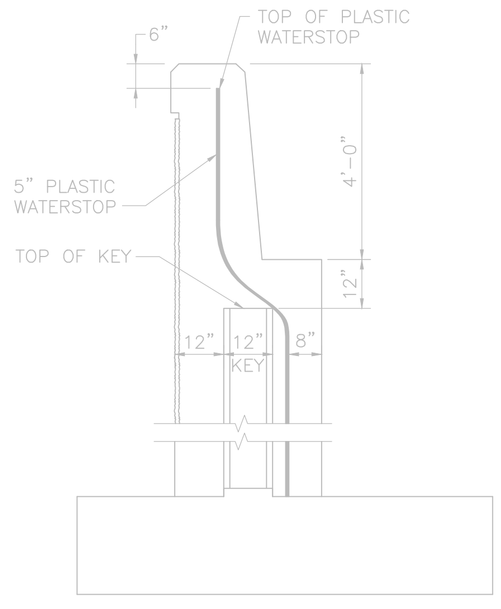
DETAIL AT TOP OF WINGWALL
SCALE: 3" = 1'-0"



WALL ELEVATION AT CONSTRUCTION JOINT
N.T.S.

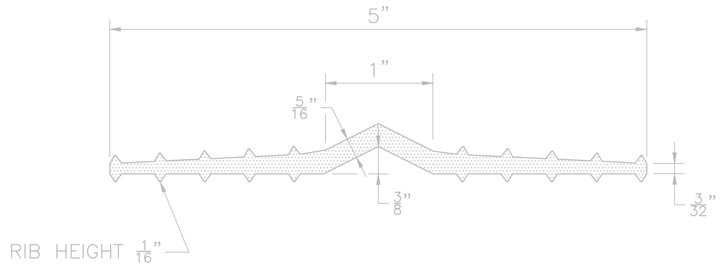


SECTION 6
N.T.S.



NOTE:
REINFORCEMENT SHALL BE CONTINUOUS THROUGH CONSTRUCTION JOINTS.

VERTICAL SECTION THROUGH CONSTRUCTION JOINT
N.T.S.



5" WATERSTOP
N.T.S.

RETAINING WALL TYPICAL SECTION

1. 4"ø WEEP HOLES AT 10'-0" MAX. O.C. LOCATED 12" ABOVE THE HEEL OF FOOTING SLOPING 1" PER FOOT TOWARDS FRONT FACE. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
2. RETAINING WALL GEOMETRY AND REINFORCEMENT SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO ORDERING MATERIALS OR STARTING WORK.
3. ALL CONCRETE SHALL BE 4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE.

RETAINING WALL DESIGN PARAMETERS

1. BACKFILL AND LOADING CONDITIONS:

   LEVEL BACKFILL
   279 PSF LIVE LOAD SURCHARGE

2. BACKFILL SOIL PROPERTIES

   ϕ = ANGLE OF INTERNAL FRICTION = 32°
   δ = ANGLE OF WALL FRICTION = 21°
   γ = EFFECTIVE UNIT WIGHT = 130 PCF

3. FOUNDATION SOIL PROPERTIES:

   FACTORED BEARING RESISTANCE = 15.0 KSF
   COEFFICIENT OF FRICTION = 0.50
   RESISTANCE FACTOR FOR SLIDING = 0.8

4. REINFORCED CONCRETE:

   f'c = 4,000 PSI
   Fy = 60,000 PSI

CULVERT MISCELLANEOUS DETAILS

MENDON
ROUTE 16

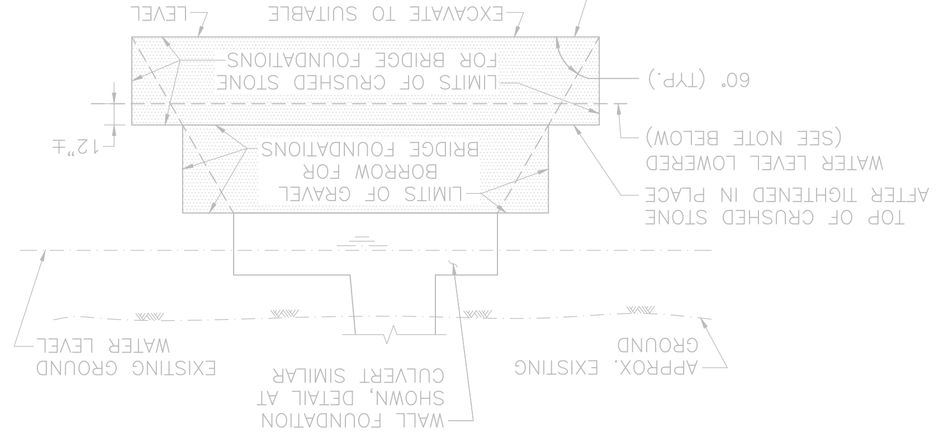
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	33	38
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LIMITS OF CRUSHED STONE AND GRAVEL BORROW FOR WALL AND CULVERT FOUNDATIONS

N.T.S.

NOTES:

1. LOWER WATER LEVEL AS MUCH AS POSSIBLE WITHOUT DISTURBING THE GRANULAR SOIL (SIDES AND BOTTOM) AND TIGHTEN THE CRUSHED STONE IN PLACE (SEE STANDARD SPECIFICATIONS).
2. REPLACE SOILS ABOVE ELEVATION 253.3 FEET BELOW PROPOSED CULVERT AND CULVERT RETAINING WALL FOUNDATIONS WITH CRUSHED STONE AND OR GRAVEL BORROW AS SHOWN AND PER SPECIFICATIONS.

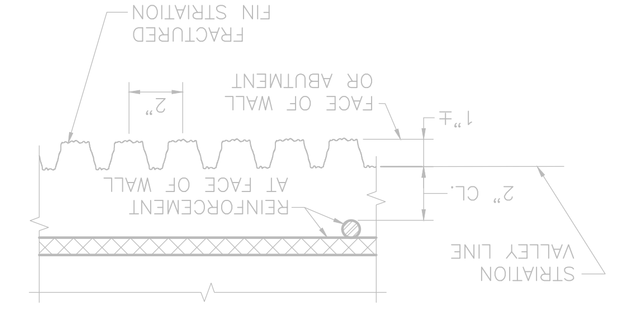


TYPICAL STRIATION DETAIL

SCALE: 3" = 1'–0"

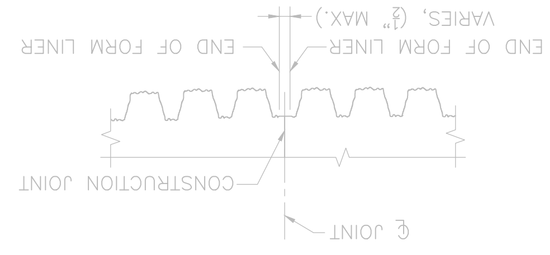
NOTES:

1. THE CONTRACTOR SHALL MAKE SURE THAT THE STRIATION FINS ARE PLUMB AND LINED UP VERTICALLY FROM PANEL TO PANEL FOR THE FULL HEIGHT OF THE WALL.
2. THE HORIZONTAL JOINT MAY BE OMITTED IF THE CONTRACTOR CAN DEMONSTRATE THAT THE FORM LINER PANELS CAN BE INSTALLED END TO END WITHOUT CREATING A VISIBLE SEAM IN THE FINAL CAST CONCRETE.



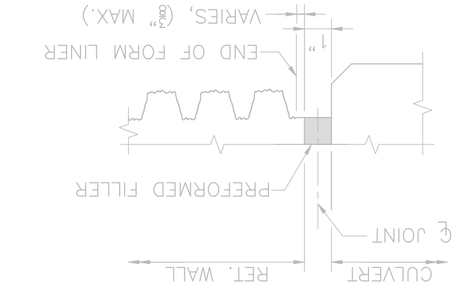
CONSTRUCTION JOINT

SCALE: 3" = 1'–0"



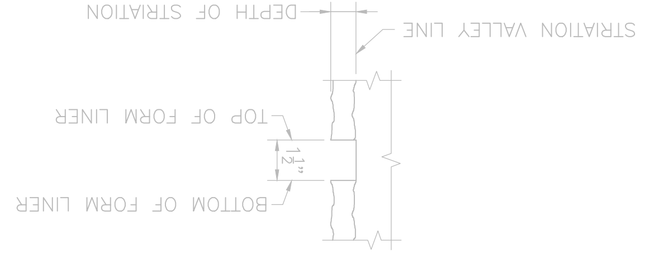
EXPANSION JOINT

SCALE: 3" = 1'–0"



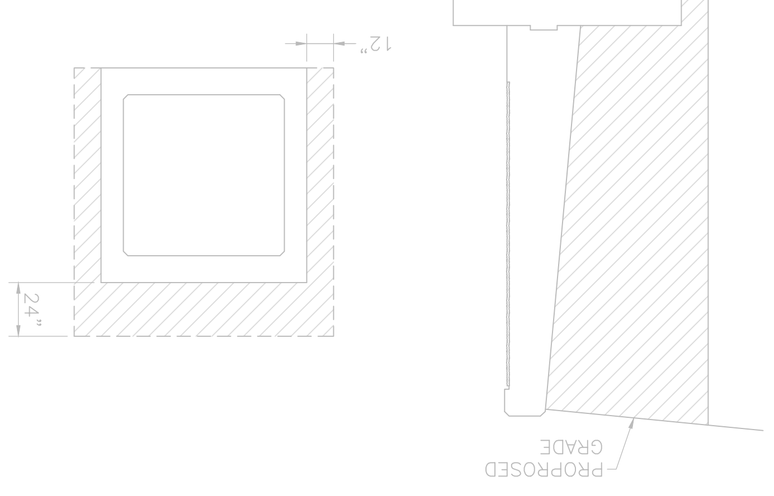
HORIZONTAL PANEL JOINT

SCALE: 3" = 1'–0"



LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES

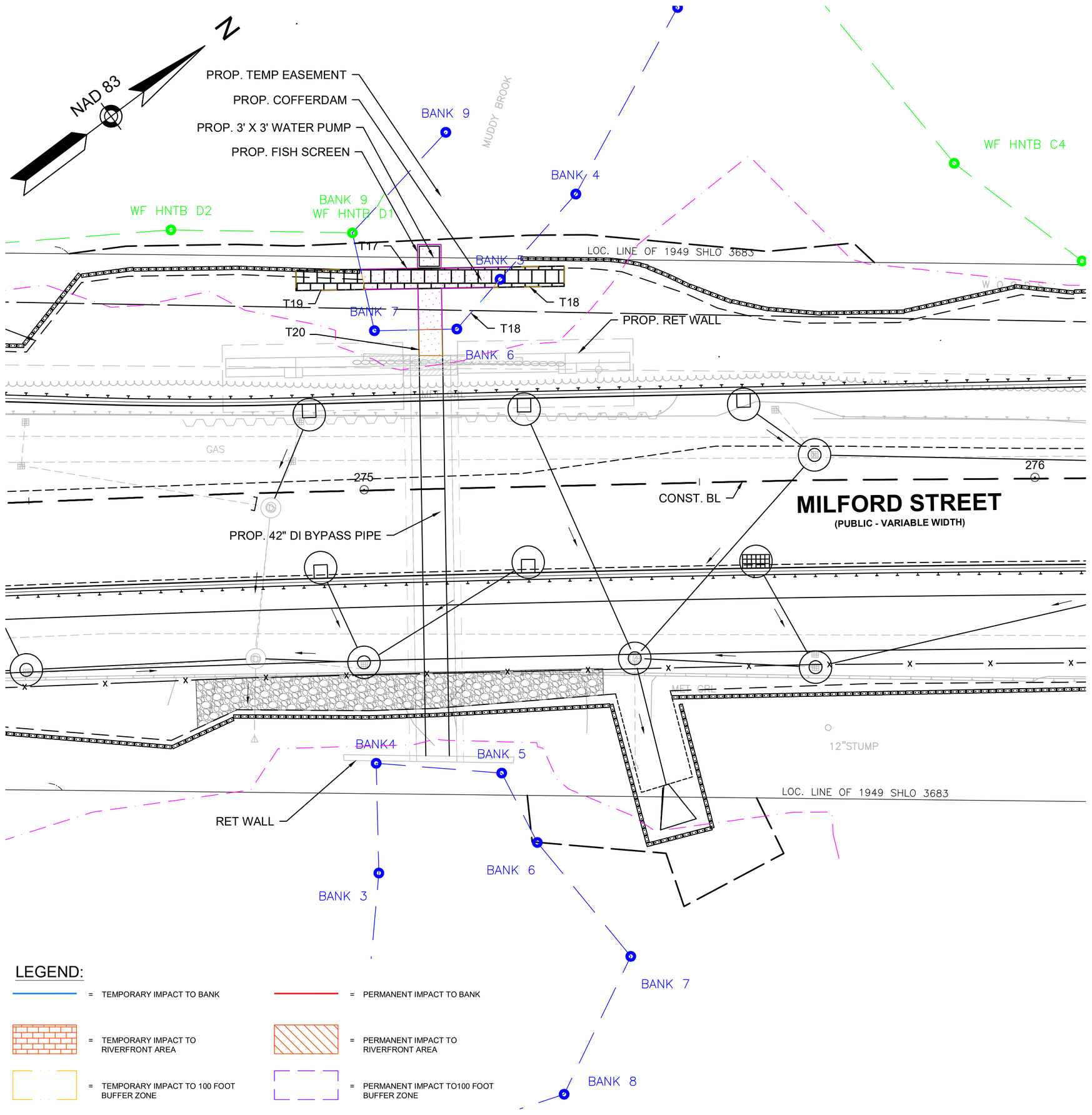
N.T.S.



MENDON
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CONTROL OF WATER



LEGEND:

- = TEMPORARY IMPACT TO BANK
- = PERMANENT IMPACT TO BANK
- = TEMPORARY IMPACT TO RIVERFRONT AREA
- = PERMANENT IMPACT TO RIVERFRONT AREA
- = TEMPORARY IMPACT TO 100 FOOT BUFFER ZONE
- = PERMANENT IMPACT TO100 FOOT BUFFER ZONE
- = TEMPORARY IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = PERMANENT IMPACT TO BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = TEMPORARY IMPACT TO LAND UNDER WATER
- = PERMANENT IMPACT TO LAND UNDER WATER
- = WETLAND DELINEATION LINES
- = LIMIT OF 200 FOOT BUFFER RIVERFRONT AREA
- = BANK DELINEATION LINES
- = LIMIT OF BORDERING LAND SUBJECTED TO FLOODING (BLSF)
- = LIMIT OF 100 FOOT BUFFER ZONE

IMPACT ID	RESOURCE AREA	EFFECTED FEATURE	IMPACT
T17	TEMPORARY IMPACT TO LAND UNDERWATER DUE TO DEWATERING ACTIVITY	MUDDY BROOK	96 SQ. FT
T18	TEMPORARY IMPACT TO BANK DUE TO DEWATERING ACTIVITY	MUDDY BROOK	35 LF
T19	TEMPORARY IMPACT TO 200-FOOT RIVERFRONT AREA AND 100-FOOT BUFFER ZONE TO DUE TO DEWATERING ACTIVITY	MUDDY BROOK	58 SQ. FT
T20	TEMPORARY IMPACT TO BORDERING LAND SUBJECTED TO FLOODING DUE TO DEWATERING ACTIVITY	MUDDY BROOK	18 SQ. FT

GENERAL UPSTREAM CULVERT HEADWALL REPLACEMENT NOTES:

1. THE WORK SHALL OCCUR ON ANY WEEKDAY MONDAY THROUGH FRIDAY. UNDER NO CIRCUMSTANCE WILL A DETOUR BE ESTABLISHED OVER THE WEEKEND WHICH INCLUDES FRIDAY NIGHT, ALL DAY SATURDAY AND SUNDAY.
2. ALL NECESSARY PERMITS FROM THE TOWN OF MENDON AND REGULATORY AGENCIES SHALL BE APPROVED PRIOR TO COMMENCEMENT OF WORK.
3. WATER LEVELS ARE SUBJECT TO CHANGE, THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS/HER OWN DETERMINATION OF WATER LEVELS THAT WILL EXIST DURING CONSTRUCTION.
4. UPON INSTALLATION AND INSPECTED ACCEPTANCE OF ALL SEDIMENT CONTROL MEASURES, THE CONTRACTOR SHALL BEGIN IMPLEMENTING THE STREAM DIVERSION AND DEWATERING PLAN.
5. CONTRACTOR IS RESPONSIBLE FOR INSTALATION OF A FISH PROTECTION SCREEN PRIOR TO THE START OF ANY DEWATERING ACTIVITIES.
6. CONTRACTOR IS RESPONSIBLE FOR CONDUCTING ALL DEWATERING ACTIVITIES DURING TIME OF YEAR (TOY) RESTRICTIONS AS REQUIRED BY MASSDEP.
7. PER OSHA REQUIREMENTS, CONTRACT TO PROVIDE A MINIMUM 10 FEET BETWEEN OPERATING EQUIPMENT, PRECAST PANELS ETC. AND OVERHEAD WIRES/UTILITY POLES.
8. INSTALL AN UPSTREAM/DOWNSTREAM COFFERDAM TO DIVERT THE FLOW OF WATER INTO THE BYPASS PIPE TO CREATE A DRY AREA ON THE DOWNSTREAM SIDE OF THE COFFERDAM. CONTRACTOR SHALL USE A WOVEN POLYPROPYLENE BAG COFFERDAM WITH BENTONITE LINING OR APPROVED EQUAL. CONTRACTOR MAY SUPPLEMENT COFFERDAM WITH TEMPORARY PRECAST CONCRETE BARRIER. CONTRACTOR TO USE A SLING TO LIFT BAG AND ONLY USE CLEAN PEA GRAVEL TO FILL BAGS. COFFERDAM HEIGHT SHALL BE 1 FOOT ABOVE THE DESIGN HIGH WATER ELEVATION FOR A TWO YEAR STORM OF 262.61'.

9.1 UPSTREAM WATER NOTES:
2-YEAR ELEVATION HEADWATER: 262.61'

9.2. WATER SURFACE ELEVATIONS AT DOWNSTREAM CULVERT:
100 YEAR FLOOD ELEVATION: 265.5'
10 YEAR FLOOD ELEVATION: 263.58'
WATER ELEVATION: 259.20'

EROSION AND SEDIMENT CONTROL SEQUENCE OF CONSTRUCTION NOTES:

1. PRIOR TO COMMENCEMENT OF LAND DISTURBING ACTIVITIES THE CONTRACTOR SHALL CONDUCT A MEETING ON SITE WITH THE TOWN OF MENDON AND MASSDOT TO DISCUSS THE APPROACH TO EROSION AND SEDIMENT CONTROL AND TO NOTE ANY SPECIAL CONDITIONS OR REQUIREMENTS FOR THE PROJECT.
2. PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITIES, INSTALL ALL PERIMETER EROSION CONTROL DEVICES AND THE CONSTRUCTION ENTRANCE. DISTURBANCE SHALL BE LIMITED TO THE MINIMUM REQUIRED TO INSTALL THE EROSION CONTROL MEASURES.
3. UPON APPROVAL OF INSTALLATION OF EROSION AND SEDIMENT CONTROL PERIMETER DEVICES, COMMENCE WITH SITE CLEARING AND GRUBBING ACTIVITIES.
4. STABILIZE ALL DENUDED AREAS WITHIN 7 DAYS OF DISTURBANCE WITH TEMPORARY OR PERMANENT VEGETATION AND SOIL STABILIZATION BLANKETS.
5. INSTALL UTILITIES AND GRADE IN ACCORDANCE WITH THE PLANS. CONSTRUCT PROPOSED DESIGN ELEMENTS INCLUDING PRECAST CULVERT, SIDE SLOPES AND ROADWAY IN ACCORDANCE WITH THE PLANS.
6. MAINTAIN SERVICE OF ALL EXISTING UTILITIES THROUGHOUT CONSTRUCTION. COORDINATE AND PLAN ANY UTILITY INTERRUPTIONS WITH THE TOWN OF MENDON.
7. MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES THROUGHOUT THE DURATION OF CONSTRUCTION. NO AREA SHALL REMAIN DENUDED MORE THAN 7 DAYS WITHOUT STABILIZATION.
8. INSPECT CONTROLS ON A WEEKLY BASIS AND AFTER EVERY STORM EVENT, ESPECIALLY AT THE PERIMETER. REPAIR ALL DAMAGED DEVICES IMMEDIATELY. COST OF REPAIR OF DAMAGED CONTROLS IS INCIDENTAL TO THE CONTRACT.

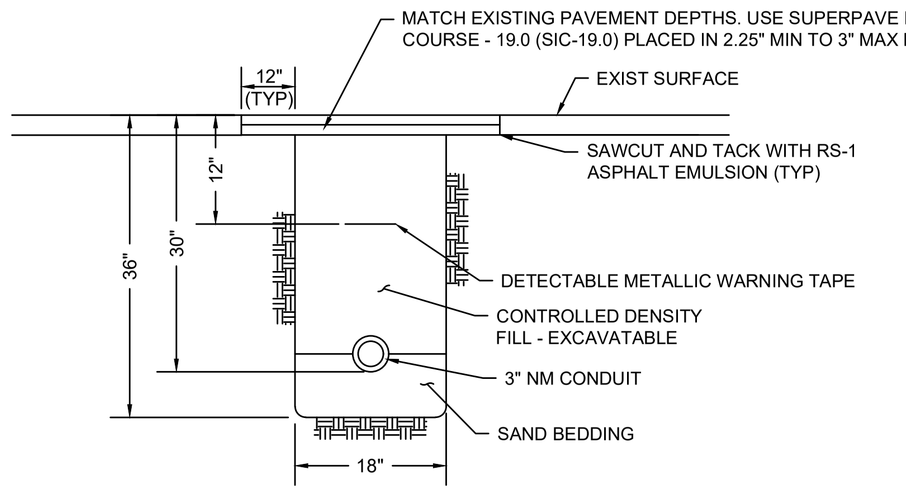
GENERAL CONSTRUCTION STAGING NOTES:

1. NO STAGING OR STOCKPILE AREAS SHALL BE ALLOWED IN THE 100 YEAR FLOODPLAIN OR ANY OTHER ENVIRONMENTALLY SENSITIVE AREA. THE 100-YEAR FLOODPLAIN ELEVATION IS ASSUMED TO BE ELEVATION 265.5 ON DOWNSTREAM SIDE AND 267 ON UPSTREAM SIDE. CONTRACTOR SHALL COORDINATE LOCATION AND SIZE OF PROSPECTIVE CONSTRUCTION LAYDOWN AREA PRIOR TO COMMENCEMENT OF WORK AND OBTAIN APPROVAL WITH THE TOWN OF MENDON. ALL WORK STORAGE, OR ANY OTHER STAGING AREAS SHALL BE STABILIZED AS NECESSARY DURING CONSTRUCTION AND UNPAVED TRAFFIC AREAS SHALL BE MATTED OR GRAVELED AND ALL CONSTRUCTION EQUIPMENT USED WITHIN THE STREAM DIVERSION MUST BE PLACED ON MATS.
2. AT THE CONTRACTORS PREFERENCE, AN ALTERNATIVE SEQUENCE OF CONSTRUCTION MAY BE PROPOSED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING THE APPROPRIATE PLANS AND REQUEST IN WRITING FOR A CHANGE TO THESE PLANS AND OBTAIN APPROVAL BY MASSDOT. NO ADDITIONAL COMPENSATION WILL BE ALLOWED FOR DELAYS CAUSED BY THE REVIEW AND APPROVAL PROCESS NOR WILL ADDITIONAL COMPENSATION BE ALLOWED IF ANY PROPOSED CHANGE IS REJECTED. MASSDOT AND OTHER PERMITTING AGENCIES SHALL DETERMINE WHETHER ANY PROPOSED ALTERNATE SEQUENCE IS ACCEPTABLE. IF NO ALTERNATE IS FOUND ACCEPTABLE THEN THE SEQUENCE SHOWN ON THESE PLANS SHALL BE FOLLOWED. CONTRACTOR SHALL SUBMIT PLANS AND CONSTRUCTION SEQUENCE FOR DEWATERING A TWO YEAR STORM AS STATED IN THE MASSDOT BRIDGE MANUAL.
3. ALL LAND WHICH IS DISTURBED BY THE CONTRACTOR, AND WHICH IS NOT BUILT UPON OR SURFACED, SHALL BE ADEQUATELY STABILIZED TO CONTROL EROSION AND SEDIMENTATION IN CONFORMANCE WITH THE CURRENT MASSDOT AND TOWN OF MENDON GUIDELINES.
4. THE DIVERSION IS NOT INTENDED TO BLOCK HIGHWATER EVENTS FROM FLOODING THE DEWATERED AREAS. NO EQUIPMENT OR UNSECURED MATERIALS WILL BE ALLOWED OVERNIGHT WITHIN THE STREAM BANKS IN CASE FLOODING OCCURS.
5. ALL PLACEMENT, ADJUSTMENTS, ETC. OF THE STREAM DIVERSION SHALL BE PERFORMED WHILE OBSERVING ANY IN-STREAM WORK RESTRICTIONS.
6. THE COST OF THE STREAM DIVERSION AND REQUIRED EQUIPMENT (PIPE, RIPRAP OUTLET PADS, PUMPS, SAND BAGS, ETC.) IS TO BE CONSIDERED INCIDENTAL TO ITEM 991.1 CONTROL OF WATER.
7. MATERIAL FOR CONSTRUCTION OF ANY KIND SHALL NOT BE STAGED WITHIN 100 FEET OF A WETLAND RESOURCE AREA THROUGHOUT THE DURATION OF CONSTRUCTION.
8. PRIOR TO COMMENCEMENT OF CULVERT WORK, DOWNSTREAM AREA SHALL BE PROTECTED FROM SCOUR AND POTENTIAL VELOCITY-INDUCED EROSION THROUGH THE INSTALLATION OF A TEMPORARY CONCRETE SCOUR PAD (4'X10'X6").
9. CONTRACTOR TO SUBMIT PLAN FOR DEWATERING WITHIN IN THE COFFERDAM ON THE UPSTREAM SIDE.

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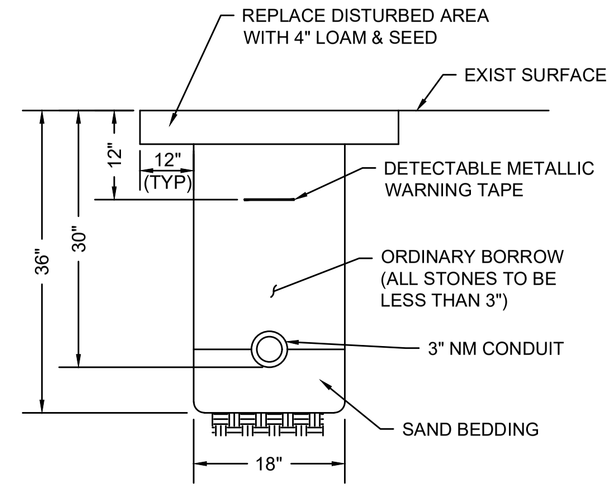
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	35	38
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 1 OF 4



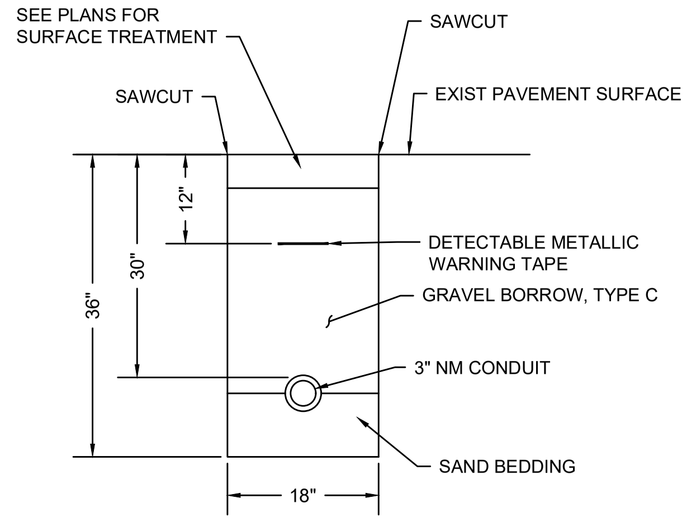
CONDUIT IN CROSSING ROADWAY
NOT TO SCALE

NOTES:
1. TEMPORARY PATCHING WITHIN MILL AND OVERLAY AREAS SHALL BE PAID FOR UNDER ITEM 451.
2. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. CONTROL DENSITY FILL SHALL MEET THE REQUIREMENTS OF MASSDOT MATERIAL SPECIFICATION M4.08.0.
4. WARNING TAPE SHALL BE PER CURRENT AMERICAN PUBLIC WORKS ASSOCIATION STANDARDS.



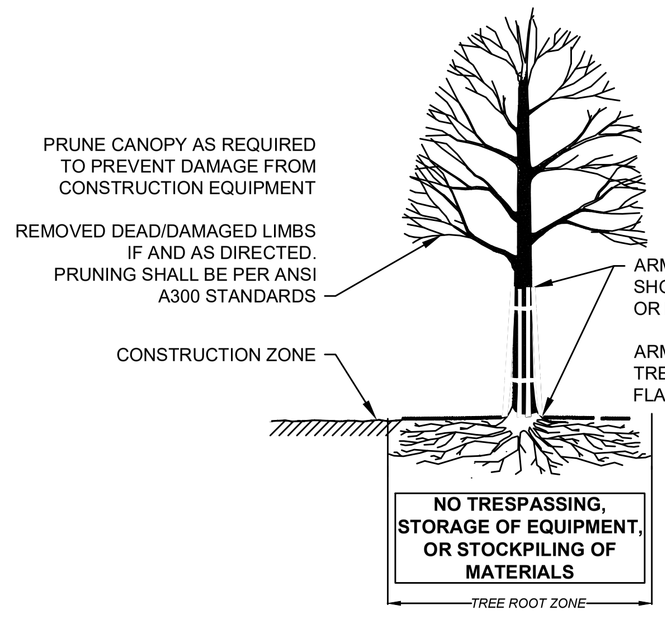
CONDUIT IN GRASS
NOT TO SCALE

NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.



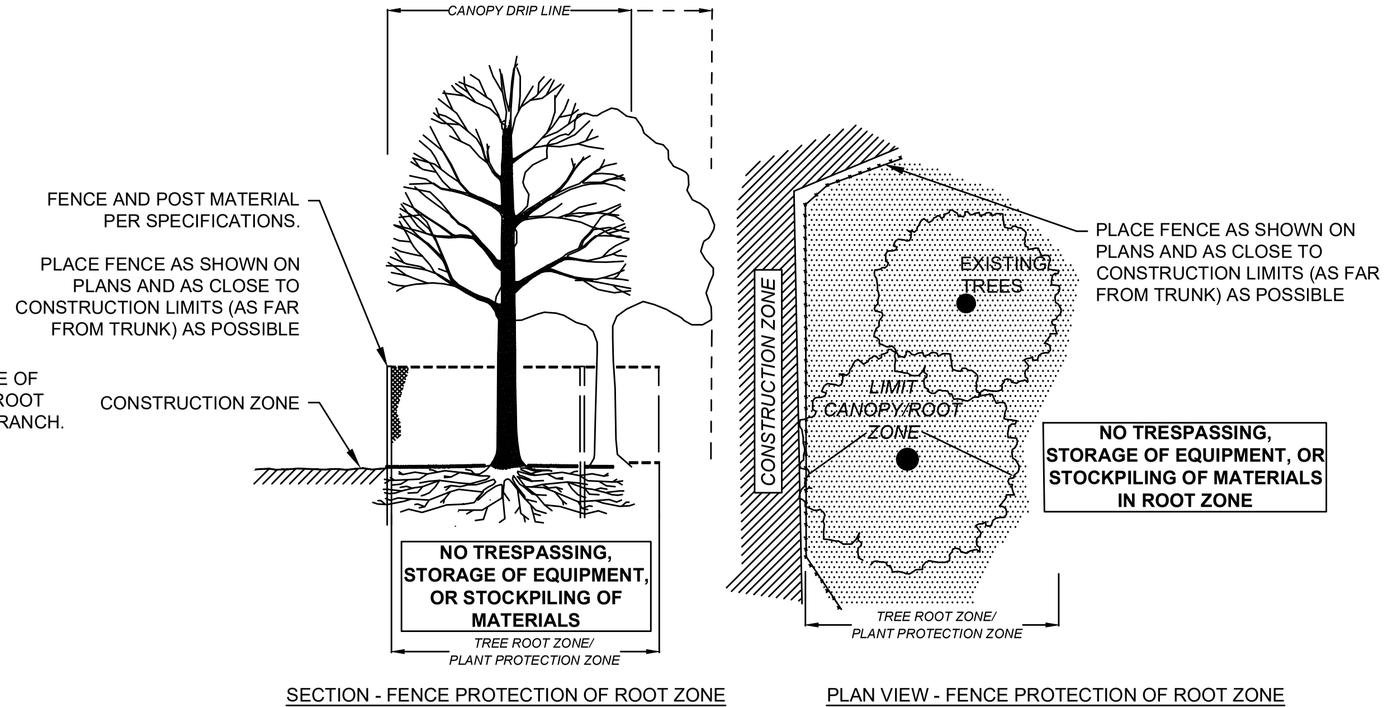
CONDUIT IN SIDEWALK
NOT TO SCALE

NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.



SECTION - TRUNK ARMORING & PRUNING

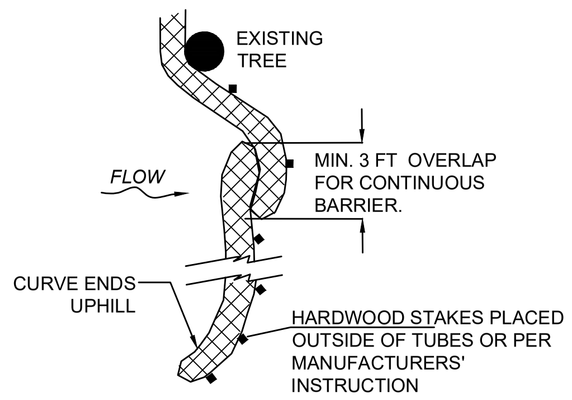
TREE PROTECTION - TRUNK
NOT TO SCALE



SECTION - FENCE PROTECTION OF ROOT ZONE

PLAN VIEW - FENCE PROTECTION OF ROOT ZONE

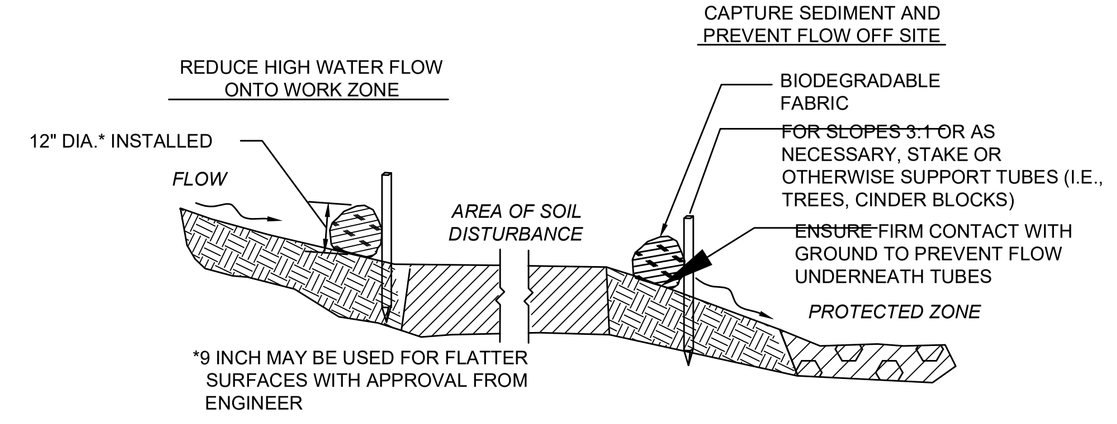
TREE PROTECTION - ROOT ZONE
NOT TO SCALE



PLACE TUBE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE, ALONG CONTOURS, AND PERPENDICULAR TO FLOW.

ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLAN VIEW

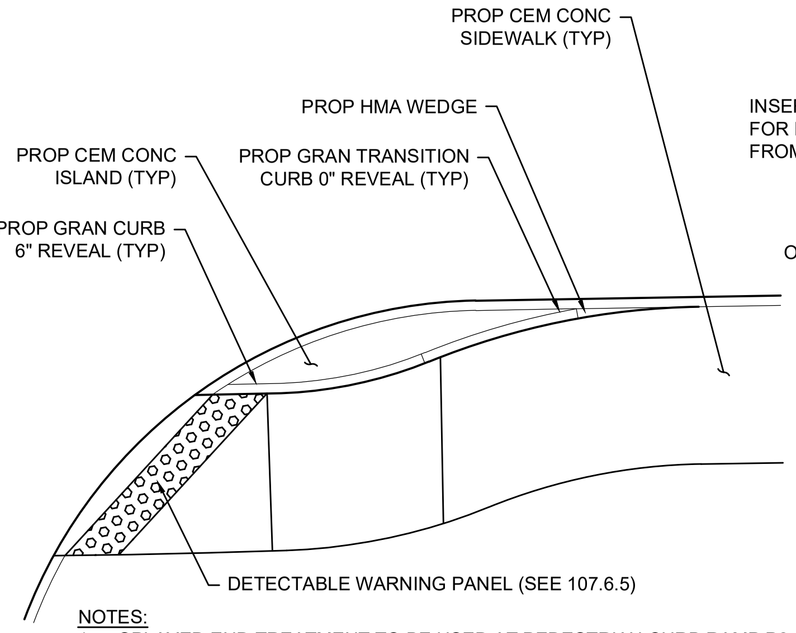


SECTION

SEDIMENT CONTROL BARRIER
NOT TO SCALE

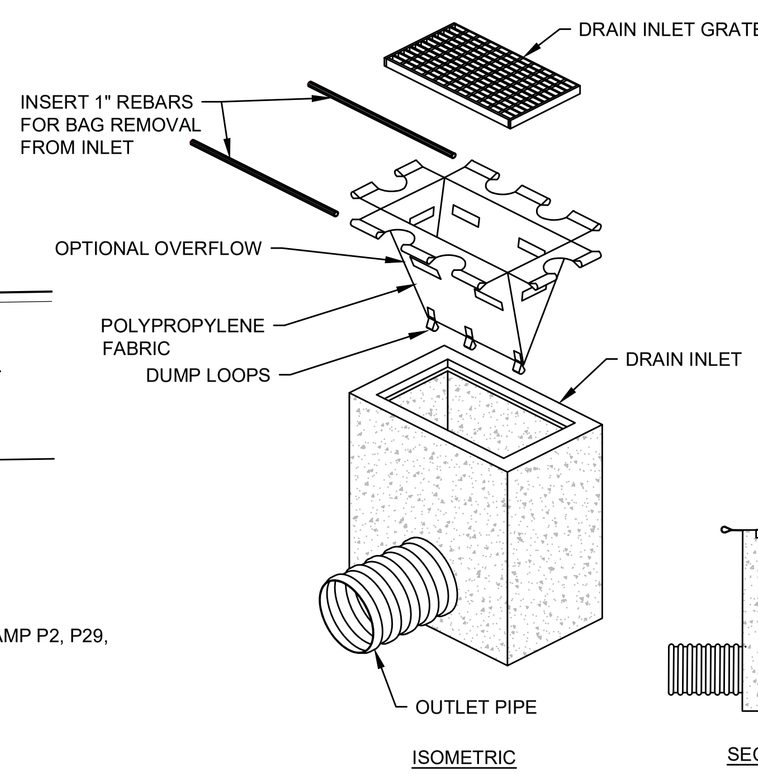
Proposal No. 608491-131468

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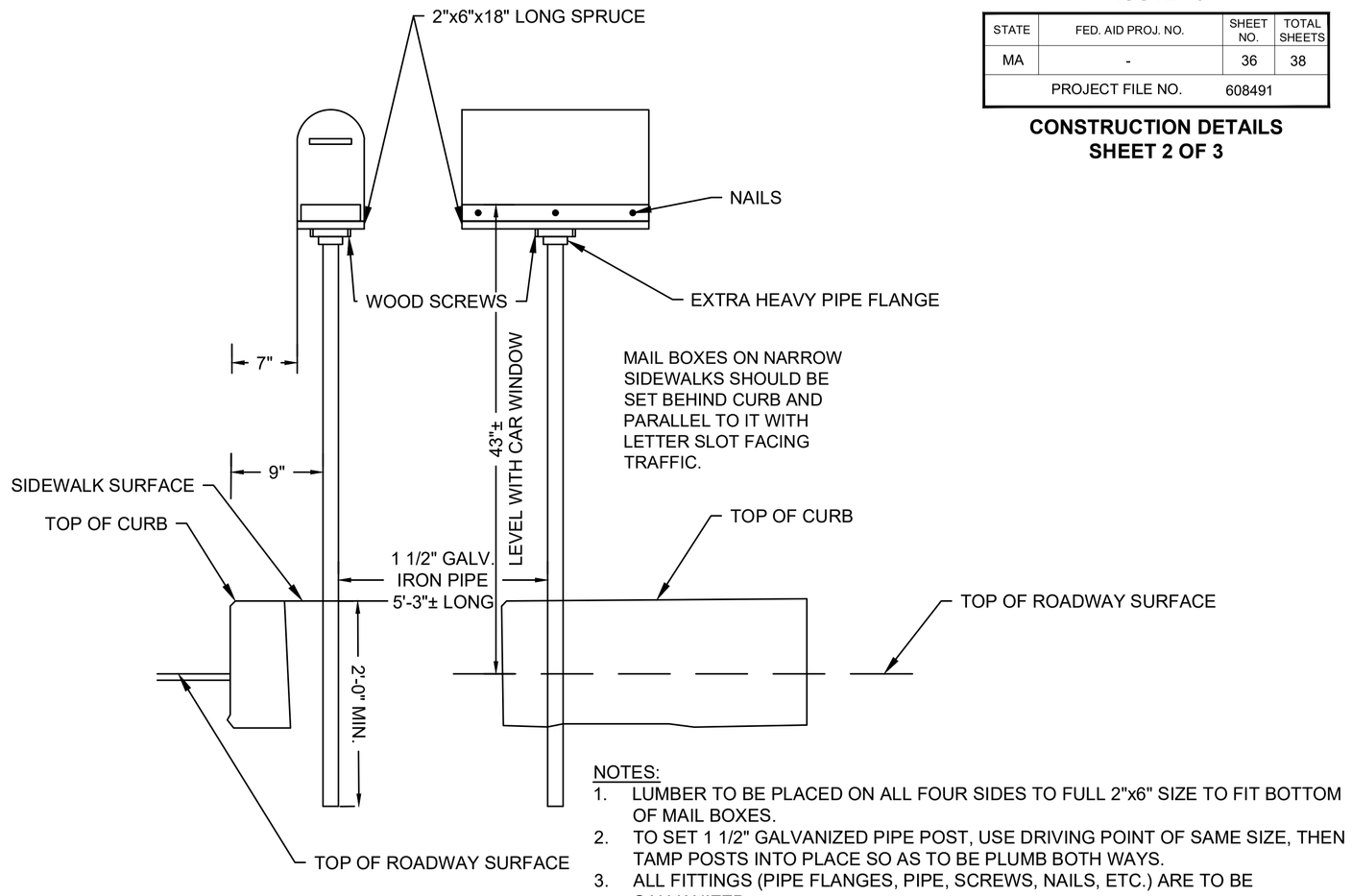
NOTES:
1. SPLAYED END TREATMENT TO BE USED AT PEDESTRIAN CURB RAMP P2, P29, P30 & P32.

SPLAYED END CURB TREATMENT
NOT TO SCALE



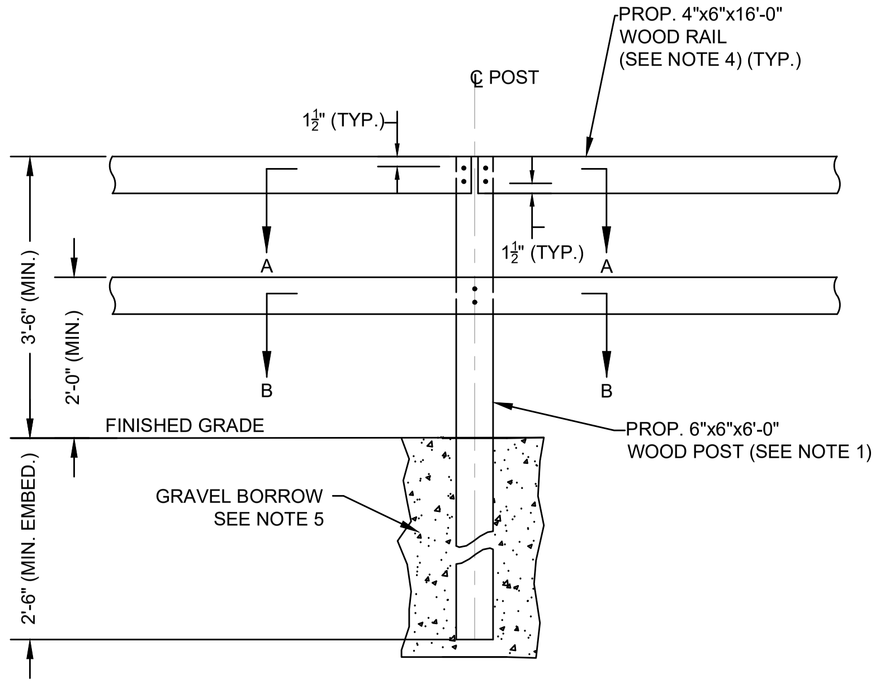
NOTES:
1. INSTALL DRAIN INLET PROTECTION PER MANUFACTURER'S SPECIFICATIONS.
2. REMOVE DRAIN INLET GRATE AND INSTALL POLYPROPYLENE FABRIC OVER DRAIN INLET FRAME. REPLACE DRAIN INLET GRATE TO SECURE POLYPROPYLENE FABRIC IN PLACE.
3. LENGTH AND WIDTH SHALL BE MANUFACTURED TO FIT THE OPENING OF THE DRAIN INLET.
4. MAINTENANCE: REMOVE ALL ACCUMULATED SEDIMENT AND DEBRIS FROM SURFACE AND VICINITY OF UNIT AFTER EACH STORM EVENT. REMOVE SEDIMENT THAT HAS ACCUMULATED WITHIN THE CONTAINMENT AREA OF THE DRAIN INLET PROTECTION SACK AS NEEDED.

TYPICAL DRAIN INLET PROTECTION
NOT TO SCALE

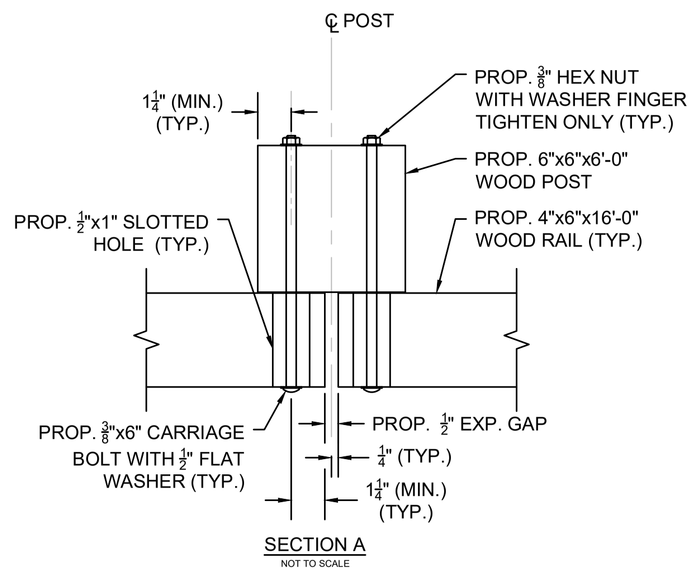


NOTES:
1. LUMBER TO BE PLACED ON ALL FOUR SIDES TO FULL 2"x6" SIZE TO FIT BOTTOM OF MAIL BOXES.
2. TO SET 1 1/2" GALVANIZED PIPE POST, USE DRIVING POINT OF SAME SIZE, THEN TAMP POSTS INTO PLACE SO AS TO BE PLUMB BOTH WAYS.
3. ALL FITTINGS (PIPE FLANGES, PIPE, SCREWS, NAILS, ETC.) ARE TO BE GALVANIZED.
4. FOR DESCRIPTIONS, MATERIALS, AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.
5. A 4"x4" PRESSURE TREATED WOOD POST MAY BE SUBSTITUTED FOR A PIPE POST.

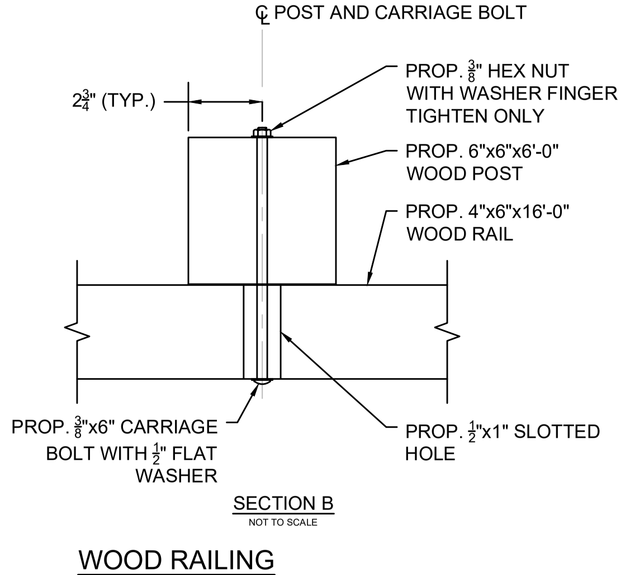
RESIDENTIAL MAILBOX
NOT TO SCALE



WOOD RAILING DETAIL
NOT TO SCALE

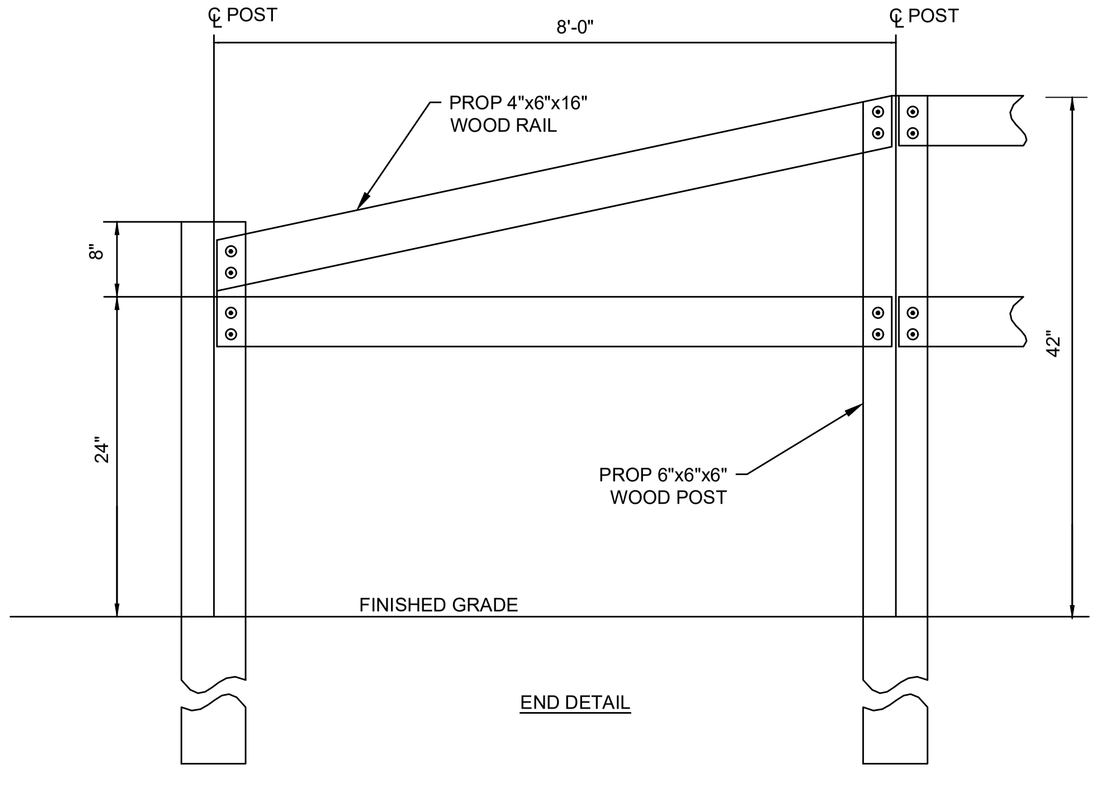


SECTION A
NOT TO SCALE

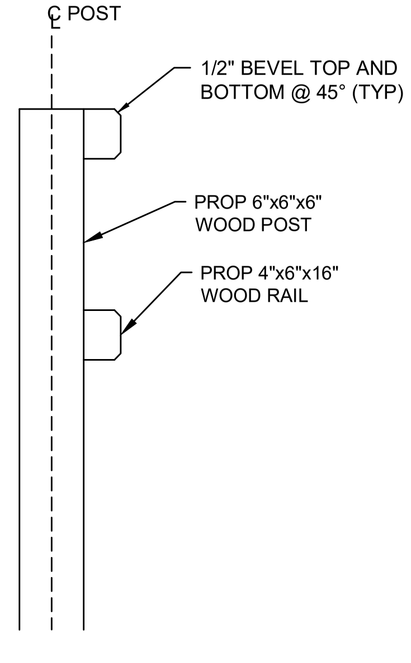


SECTION B
NOT TO SCALE

WOOD RAILING
NOT TO SCALE



END DETAIL



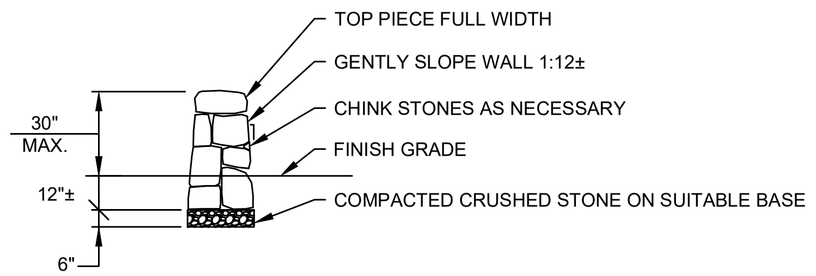
NOTES:
1. POSTS SHALL BE PLACED 8'-0" ON CENTER.
2. THE FACE OF RAIL SHALL BE SET OFF THE EDGE OF BIKE PATH PAVEMENT, AS SHOWN ON THE PLANS, AND AS DIRECTED BY THE ENGINEER.
3. ALL HARDWARE SHALL BE GALVANIZED.
4. ALTERNATE JOINTS IN RAILING BETWEEN POSTS
5. CONTRACTOR SHALL SET POST IN 4,000 PSI, 1-1/2IN, 565 CEMENT CONCRETE FOR ALL POSTS UNABLE TO BE SET AT REQUIRED DEPTH.
6. THESE RAILS SHALL ONLY BE INSTALLED BETWEEN POSTS ADJACENT TO RETAINING WALL LOCATIONS.

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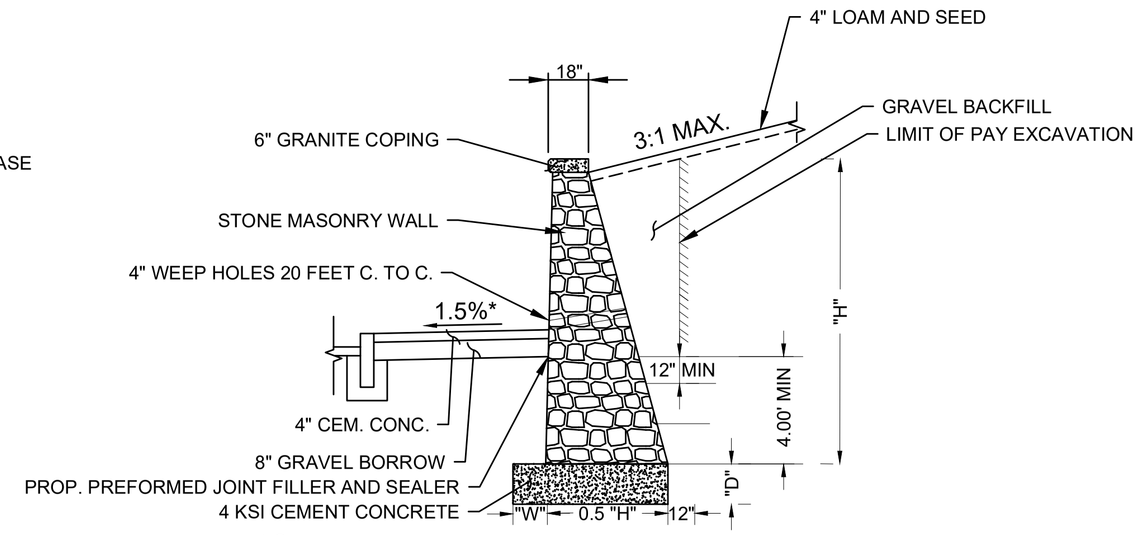
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	37	38
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 3 OF 4

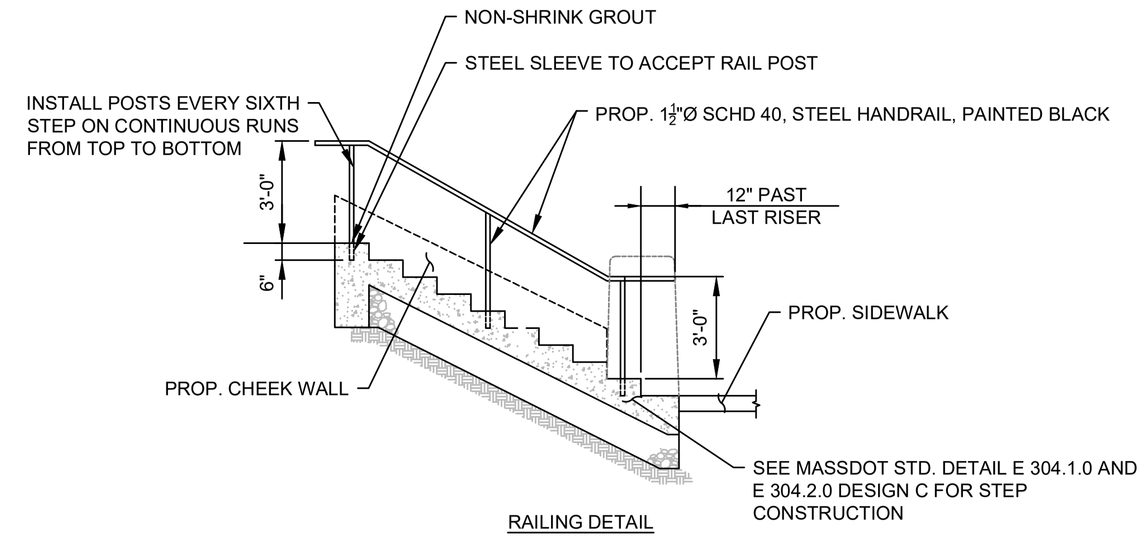


R&R BALANCE STONE WALL
NOT TO SCALE

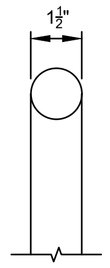


NOTE:
1. SEE MASSDOT STANDARD DETAIL E 302.2.0 FOR FURTHER INFORMATION.
2. H, D AND W ALL VARY DEPENDING ON STANDARD DETAIL E 302.2.0.

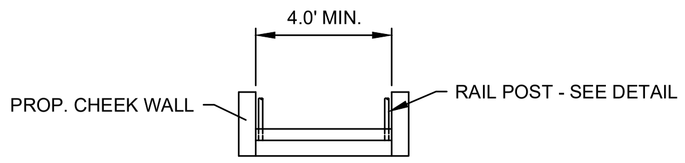
WALL TYPE - LOW CEMENTED STONE MASONRY RETAINING WALL
NOT TO SCALE



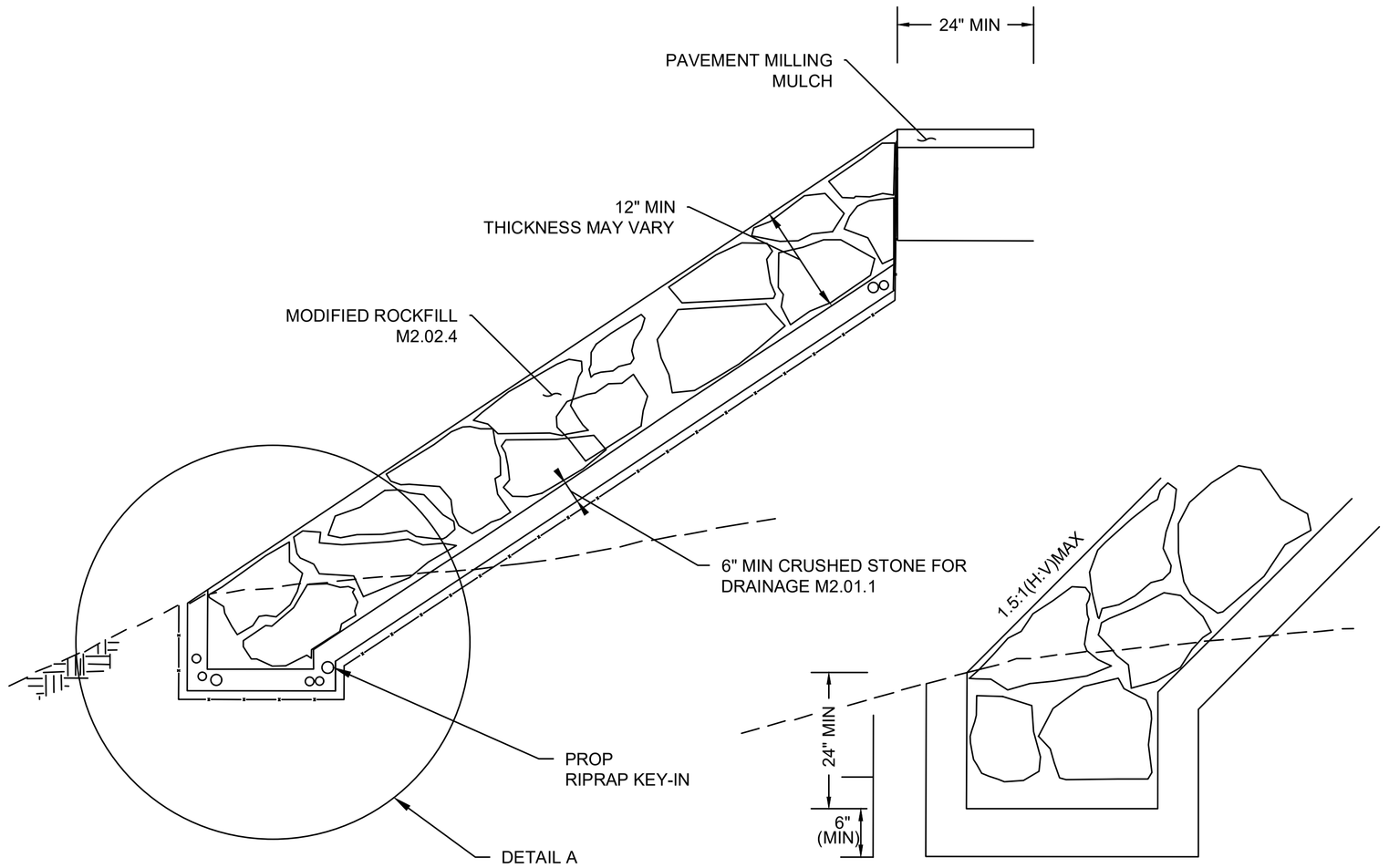
CEMENT CONCRETE STEPS & HANDRAIL DETAIL
NOT TO SCALE



HANDRAIL
NOT TO SCALE

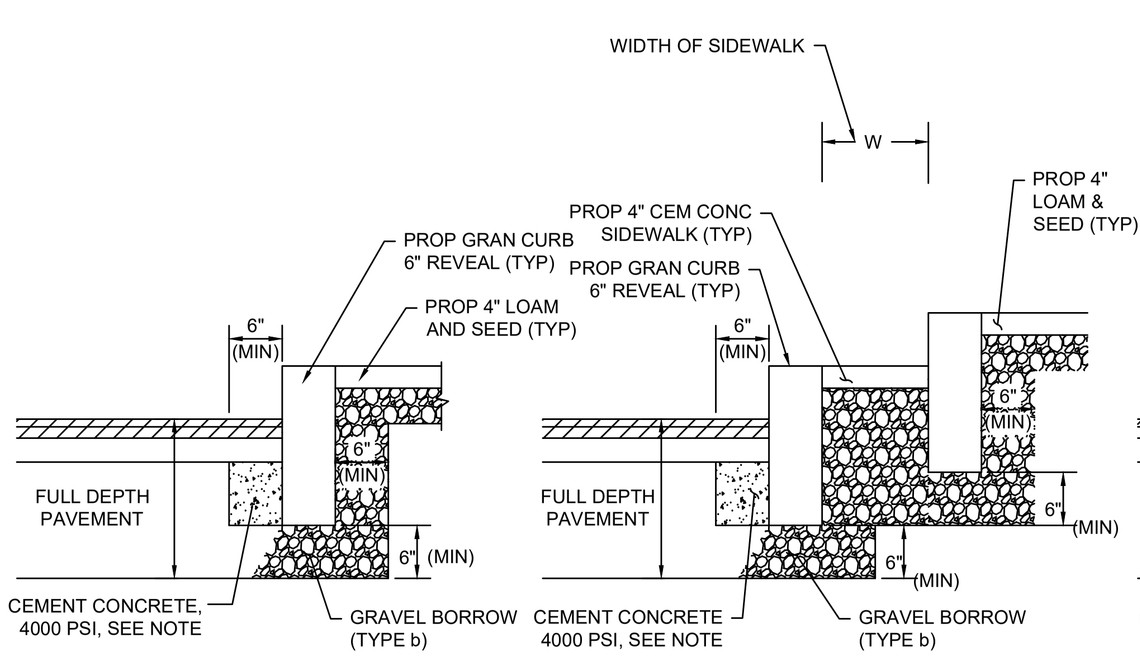


HANDRAIL - SECTION
NOT TO SCALE



KEY-IN DETAIL A

MODIFIED ROCKFILL
NOT TO SCALE

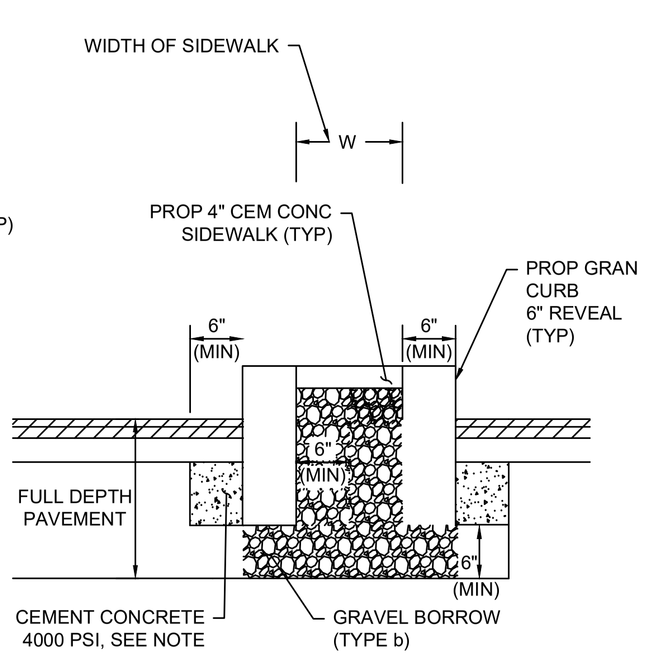


NOTE:
CEMENT CONCRETE SHALL BE PLACED ONLY WHEN CURB IS TO BE SET AFTER BASE COURSE IS PAVED.

GRANITE CURB, TYPE VB,
IN FULL DEPTH PAVEMENT
NOT TO SCALE

NOTE:
CEMENT CONCRETE SHALL BE PLACED ONLY WHEN CURB IS TO BE SET AFTER BASE COURSE IS PAVED.

GRANITE CURB, TYPE VB,
IN FULL DEPTH PAVEMENT &
BACK OF SIDEWALK
NOT TO SCALE



NOTE:
CEMENT CONCRETE SHALL BE PLACED ONLY WHEN CURB IS TO BE SET AFTER BASE COURSE IS PAVED.

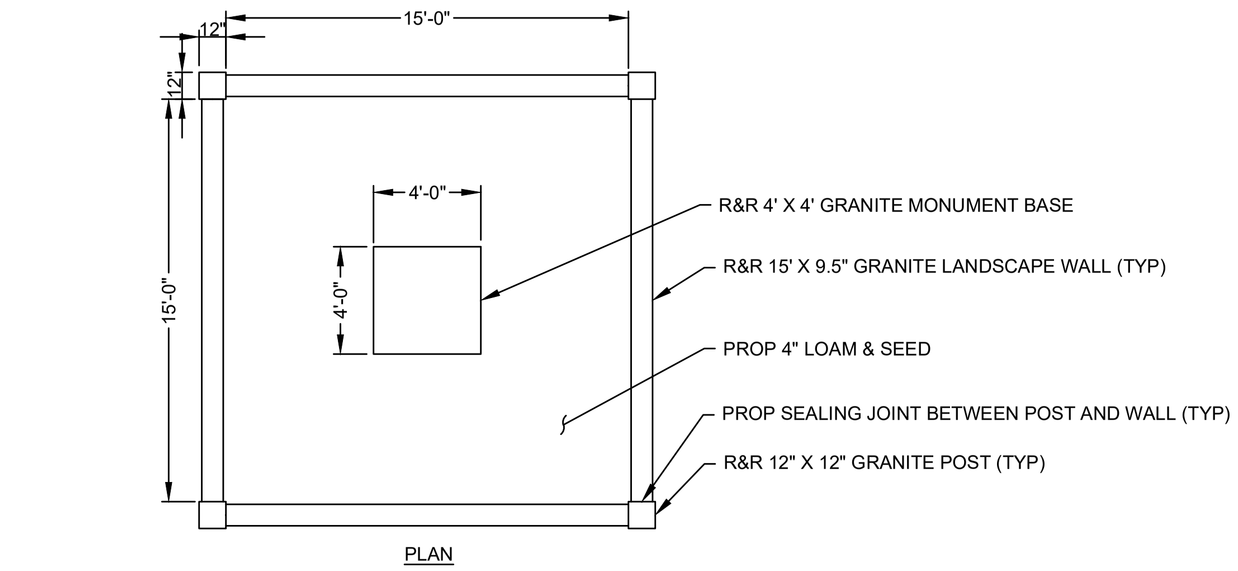
GRANITE CURB, TYPE VB,
IN FULL DEPTH PAVEMENT &
BACK OF SIDEWALK WITH
PARKING LOT
NOT TO SCALE

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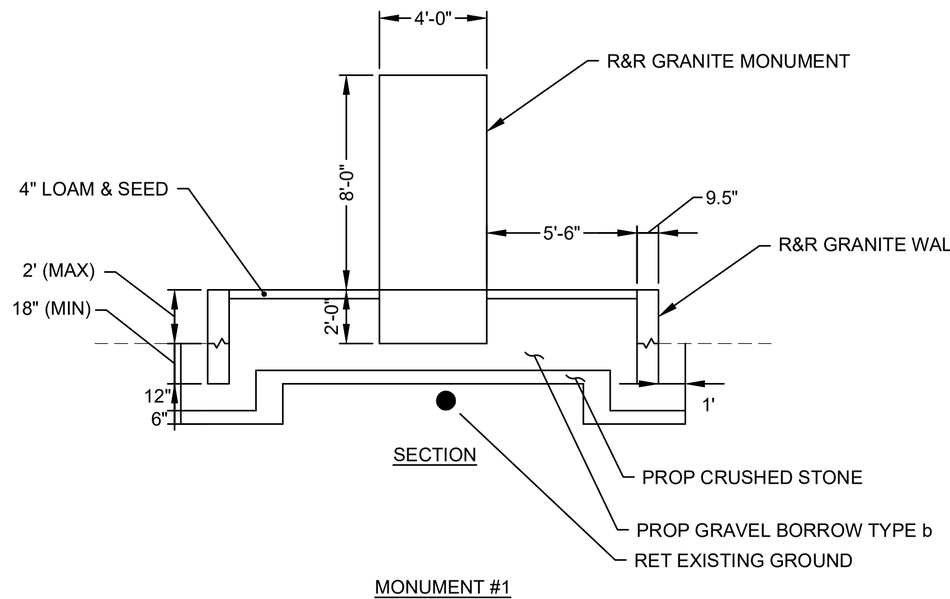
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	38	38
PROJECT FILE NO.	608491		

CONSTRUCTION DETAILS
SHEET 4 OF 4



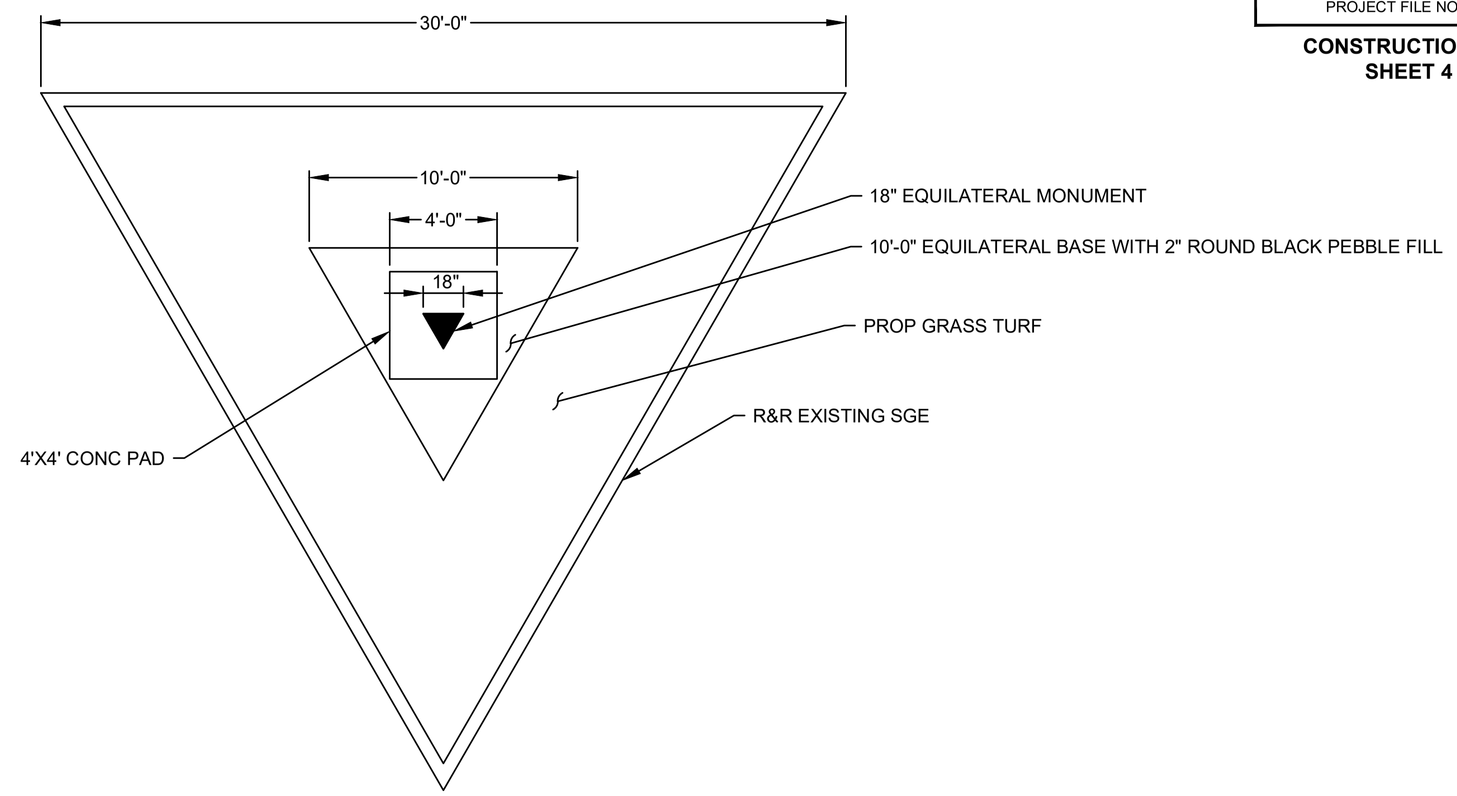
PLAN



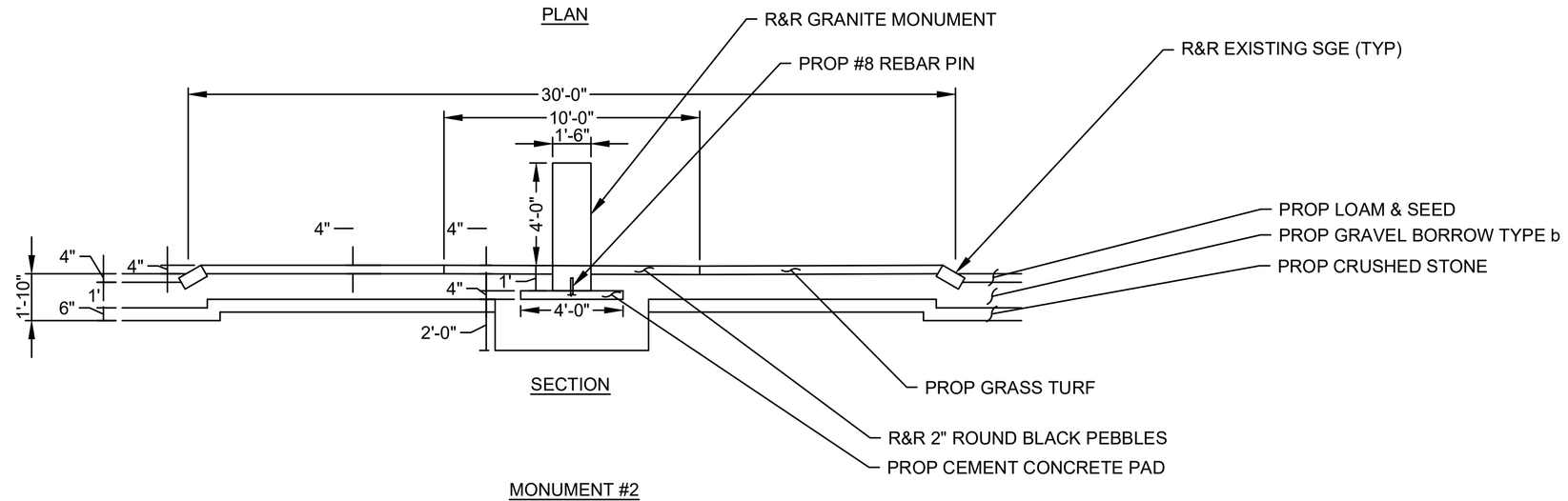
MONUMENT #1
NOT TO SCALE

MONUMENT #1 NOTES:

1. DIMENSIONS FOR MONUMENTS ARE APPROXIMATE AND CONTRACTOR TO RELOCATE MONUMENTS IN KIND.
2. MONUMENT "A" IS TO HAVE ALL WALLS AND POSTS REMOVED AND RESET TO THE NEW LOCATION.
3. COLORED JOINT SEALANT TO BE USED WHERE GRANITE POST AND WALLS JOIN TOGETHER.
4. CONTRACTOR TO PROVIDE ORDINARY BORROW, GRAVEL BORROW, CRUSHED STONE & LOAM AND SEED WHERE NECESSARY FOR BOTH MONUMENTS.
5. CONTRACTOR TO SET THE GRANITE POSTS AND WALLS USING ITEM 901. (4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE).
6. MONUMENT "A" TO BE SET BY CONTRACTOR PRIOR TO POURING OF CONCRETE SURROUNDING PLAZA.



PLAN



MONUMENT #2
NOT TO SCALE

MONUMENT #2 NOTES:

1. DIMENSIONS FOR MONUMENTS ARE APPROXIMATE AND CONTRACTOR TO RELOCATE MONUMENTS IN KIND.
2. EXISTING SLOPED GRANITE EDGING AND LANDSCAPE LIGHTING AT MONUMENT "B" TO BE REMOVED AND RESET AT NEW LOCATION. LIGHTING IS SOLAR POWERED AND NO HARDWIRING IS INCLUDED.
3. MONUMENT "B" TO HAVE NEW OUTDOOR ARTIFICIAL TURF AND BLACK 2" ROUND PEBBLES INSTALLED TO BE REUSED FROM EXISTING MONUMENT.
4. COLORED JOINT SEALANT TO BE USED WHERE GRANITE POST AND WALLS JOIN TOGETHER.
5. CONTRACTOR TO PROVIDE ORDINARY BORROW, GRAVEL BORROW, CRUSHED STONE & LOAM AND SEED WHERE NECESSARY FOR BOTH MONUMENTS.
6. CONTRACTOR TO FORM A NEW CONCRETE PAD (4'X4' & 4" DEPTH) FOR MONUMENT "B" BY USING ITEM 901. (4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE).
7. A #8 BAR TO BE SET IN THE CONCRETE PAD SO THAT THE MONUMENT STRUCTURE CAN REST IN PLACE. NO ADHESIVE IS REQUIRED TO ADHERE THE MONUMENT WITH THE CONCRETE PAD.

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Appendix D – Landscape Plans

MENDON
ROUTE 16

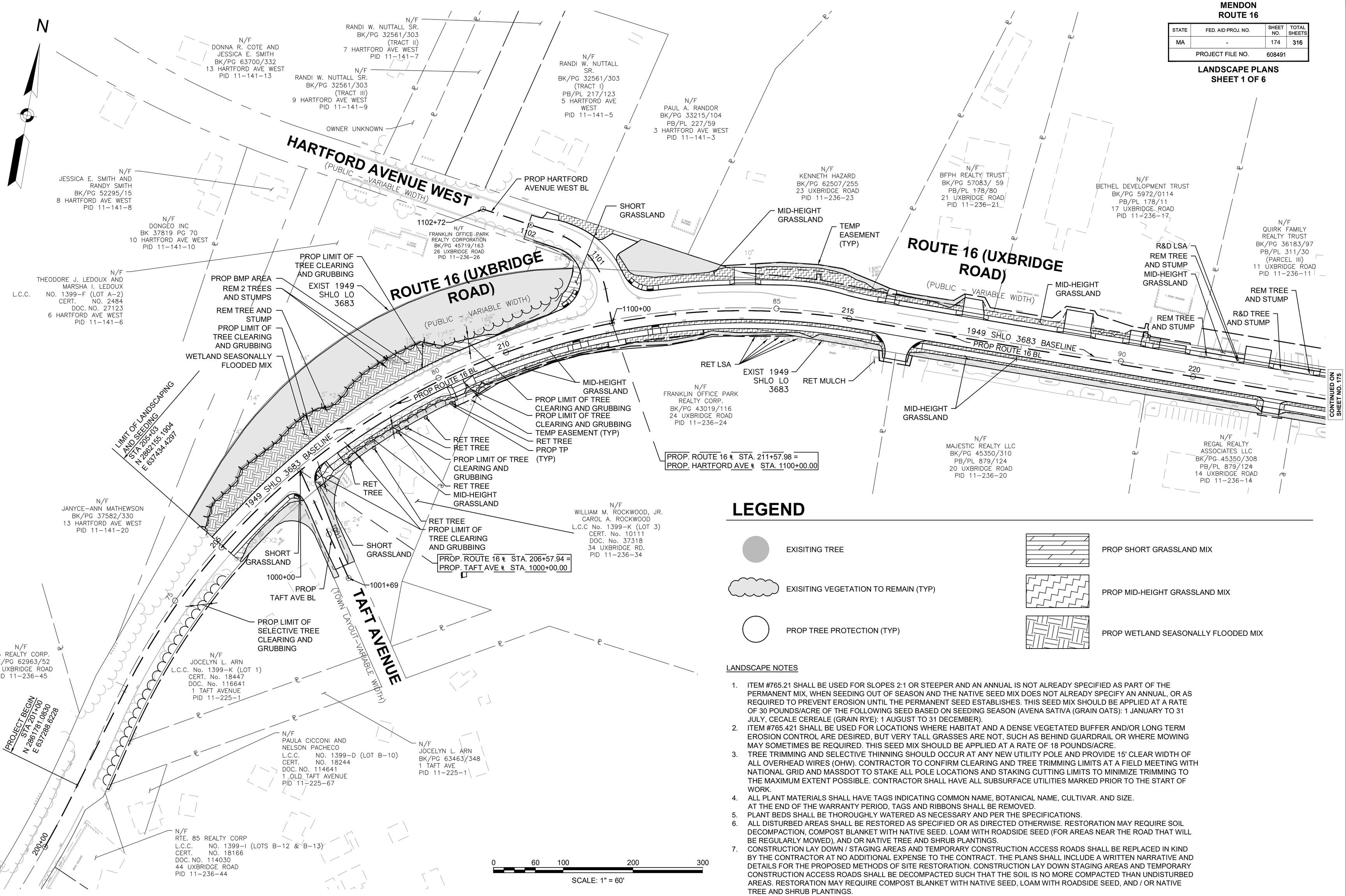
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	174	316
PROJECT FILE NO.	608491		

LANDSCAPE PLANS
SHEET 1 OF 6

608491_HID16(LANDSCAPE PLANS).DWG Plotted on 22-Feb-2024 7:30 AM

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LEGEND

- EXISITING TREE
- EXISITING VEGETATION TO REMAIN (TYP)
- PROP TREE PROTECTION (TYP)
- PROP SHORT GRASSLAND MIX
- PROP MID-HEIGHT GRASSLAND MIX
- PROP WETLAND SEASONALLY FLOODED MIX

LANDSCAPE NOTES

1. ITEM #765.21 SHALL BE USED FOR SLOPES 2:1 OR STEEPER AND AN ANNUAL IS NOT ALREADY SPECIFIED AS PART OF THE PERMANENT MIX, WHEN SEEDING OUT OF SEASON AND THE NATIVE SEED MIX DOES NOT ALREADY SPECIFY AN ANNUAL, OR AS REQUIRED TO PREVENT EROSION UNTIL THE PERMANENT SEED ESTABLISHES. THIS SEED MIX SHOULD BE APPLIED AT A RATE OF 30 POUNDS/ACRE OF THE FOLLOWING SEED BASED ON SEEDING SEASON (AVENA SATIVA (GRAIN OATS): 1 JANUARY TO 31 JULY, CECALE CEREALE (GRAIN RYE): 1 AUGUST TO 31 DECEMBER).
2. ITEM #765.421 SHALL BE USED FOR LOCATIONS WHERE HABITAT AND A DENSE VEGETATED BUFFER AND/OR LONG TERM EROSION CONTROL ARE DESIRED, BUT VERY TALL GRASSES ARE NOT, SUCH AS BEHIND GUARDRAIL OR WHERE MOWING MAY SOMETIMES BE REQUIRED. THIS SEED MIX SHOULD BE APPLIED AT A RATE OF 18 POUNDS/ACRE.
3. TREE TRIMMING AND SELECTIVE THINNING SHOULD OCCUR AT ANY NEW UTILITY POLE AND PROVIDE 15' CLEAR WIDTH OF ALL OVERHEAD WIRES (OHW). CONTRACTOR TO CONFIRM CLEARING AND TREE TRIMMING LIMITS AT A FIELD MEETING WITH NATIONAL GRID AND MASSDOT TO STAKE ALL POLE LOCATIONS AND STAKING CUTTING LIMITS TO MINIMIZE TRIMMING TO THE MAXIMUM EXTENT POSSIBLE. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
4. ALL PLANT MATERIALS SHALL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR. AND SIZE. AT THE END OF THE WARRANTY PERIOD, TAGS AND RIBBONS SHALL BE REMOVED.
5. PLANT BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER THE SPECIFICATIONS.
6. ALL DISTURBED AREAS SHALL BE RESTORED AS SPECIFIED OR AS DIRECTED OTHERWISE. RESTORATION MAY REQUIRE SOIL DECOMPACTION, COMPOST BLANKET WITH NATIVE SEED. LOAM WITH ROADSIDE SEED (FOR AREAS NEAR THE ROAD THAT WILL BE REGULARLY MOWED), AND OR NATIVE TREE AND SHRUB PLANTINGS.
7. CONSTRUCTION LAY DOWN / STAGING AREAS AND TEMPORARY CONSTRUCTION ACCESS ROADS SHALL BE REPLACED IN KIND BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE CONTRACT. THE PLANS SHALL INCLUDE A WRITTEN NARRATIVE AND DETAILS FOR THE PROPOSED METHODS OF SITE RESTORATION. CONSTRUCTION LAY DOWN STAGING AREAS AND TEMPORARY CONSTRUCTION ACCESS ROADS SHALL BE DECOMPACTED SUCH THAT THE SOIL IS NO MORE COMPACTED THAN UNDISTURBED AREAS. RESTORATION MAY REQUIRE COMPOST BLANKET WITH NATIVE SEED, LOAM WITH ROADSIDE SEED, AND / OR NATIVE TREE AND SHRUB PLANTINGS.

608491_HID16(LANDSCAPE PLANS).DWG Plotted on 22-Feb-2024 7:31 AM
Proposal No. 608491-131468
A00860 - 174

N

LEGEND

- EXISITING TREE
- EXISITING VEGETATION TO REMAIN (TYP)
- PROP TREE PROTECTION (TYP)
- PROP SHORT GRASSLAND MIX
- PROP MID-HEIGHT GRASSLAND MIX
- PROP WETLAND SEASONALLY FLOODED MIX

N/F
PETER COFFIN AND
JULIE N. COFFIN
BK/PG 53397/91
L.C.C No. 18875-B (LOT 1)
CERT. No. 17930
DOC. No. 112178
31 HASTINGS STREET
PID 11-142-31

N/F
DAVID E. BUTZ
BK/PG 27528/64
PB/PL 506/74
33 HASTINGS STREET
PID 11-142-33

N/F
AMBRO DEVELOPMENT, LLC
BK/PG 56459/282
29 HASTINGS STREET
PID 11-142-29

CONTINUED ON SHEET NO. 176

MID-HEIGHT GRASSLAND
R&D 4 TREES
TEMP EASEMENT (TYP)

N/F
HASTING STREET PLAZA LLC
BK/PG 59891/137
PB/PL 304/25
35 HASTINGS STREET
PID 11-142-35

ROUTE 16 (HASTINGS STREET)
(PUBLIC - VARIABLE WIDTH)

N/F
QUIRK FAMILY
REALTY TRUST
BK/PG 36183/97
PB/PL 311/30
(PARCEL III)
11 UXBRIDGE ROAD
PID 11-236-11

N/F
QUIRK FAMILY
REALTY TRUST
BK/PG 36183/97
PB/PL 311/30
(PARCEL IV)
9 UXBRIDGE ROAD
PID 11-236-9

N/F
D. FRANCIS MURPHY INSURANCE
AGENCY INC.
BK/PG 29401/60
PB/PL 196/47
1 UXBRIDGE ROAD
PID 11-236-1

ROUTE 16 (UXBRIDGE ROAD)
(PUBLIC - VARIABLE WIDTH)

PROP LIMIT OF TREE CLEARING & GRUBBING

N/F
JOHN E. QUIRK JR.
BK/PG 47850/257
PB/PL 265/29
5 UXBRIDGE ROAD
PID 11-236-5

MID-HEIGHT GRASSLAND
EXIST 1949 SHLO LO 3683
RET (2) SHRUBS
1949 SHLO 3683 BASELINE
R&D TREE AND STUMP
R&D MULCH
R&D 2 TREES AND STUMPS
R&D TREE AND STUMP
R&D EXIST LANDSCAPE
R&D TREE AND STUMP
MID-HEIGHT GRASSLAND
REM MULCH
R&D TREE AND STUMP
PROP WOOD CHIP MULCH
R&D TREE AND STUMP
RET TREES

REM TREE AND STUMP
R&D TREE AND STUMP
R&D EXIST LANDSCAPE
R&D 2 TREES AND STUMPS
R&D TREE AND STUMP
R&D TREE AND STUMP
MID-HEIGHT GRASSLAND
12" PINE
RET STUMP
18" SYCAMORE
R&D EXIST STUMP
RET STUMP
MID-HEIGHT GRASSLAND

N/F
COUNTRY PLAZA LLC
BK/PG 42956/382
PB/PL 564/57
32 HASTINGS STREET
PID 11-142-32

N/F
28 HASTINGS STREET
CORP.
BK/PG 34975/341
PB/PL 325/93
28 HASTINGS STREET
PID 11-142-28

CONTINUED ON SHEET NO. 174

PROP ROUTE 16 BL
MID-HEIGHT GRASSLAND
EXIST 1949 SHLO LO 3683
1949 SHLO 3683 BASELINE
RET LSA
TEMP EASEMENT (TYP)
RET BUSHES
MID-HEIGHT GRASSLAND
RET MULCH

PROP. ROUTE 16 ℄ STA. 231+62.39 =
PROP. MILLVILLE STREET ℄ STA. 400+00.00

PROP MILLVILLE STREET BL

MILLVILLE STREET
(PUBLIC - 60' WIDE)

N/F
REGAL REALTY
ASSOCIATES LLC
BK/PG 45350/308
PB/PL 879/124
14 UXBRIDGE ROAD
PID 11-236-14

N/F
JACKSEAN LLC
BK/PG 33700/396
PB/PL 809/111
10 UXBRIDGE ROAD
PID 11-236-10

N/F
LEAHPATRICK LLC
BK/PG 42840/148
PB/PL 863/42
8 UXBRIDGE ROAD
PID 11-236-8

N/F
FINO REALTY TRUST II
BK/PG 18455/123
6 UXBRIDGE ROAD
PID 11-236-6

LANDSCAPE NOTES

1. SEE SHEET 174

0 60 100 200 300
SCALE: 1" = 60'

Proposal No. 608491-131468

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N

N/F
BETHANY COMMUNITY CHURCH
BK/PG 53092/234
PB/PL 436/100
3 HASTINGS STREET
PID 8-142-3

BETHANY COMMUNITY CHURCH
BK/PG 53092/234
PB/PL 365/80
9 HASTINGS STREET
PID 8-142-9

N/F
THE HAYWOOD HOUSE LLC
BK/PG 40795/254
7 HASTINGS STREET
PID 8-142-7

R&D EXIST LANDSCAPE FOR GRADING AND PROP SW WORK

MID-HEIGHT GRASSLAND

TEMP EASEMENT (TYP)

REM 7 BUSHES

EXIST 1949 SHLO LO 3683

PROP. ROUTE 16 ℄ STA. 250+77.23 =
PROP. ELM STREET ℄ STA. 1200+00.00

1200+00

EXIST 1949 SHLO LO 3683

PROP LIMIT OF TREE CLEARING AND GRUBBING

N/F
PATRICK J. MCSHANE
AND LESLIE J. MCSHANE
BK/PG 17278/9
11 HASTINGS STREET
PID 8-142-11

PROP ROUTE 16 BL

MID-HEIGHT GRASSLAND

RET TREES

N/F
TOWN OF MENDON
FOUNDERS PARK
BK/PG 1818/566
BK/PG 1844/373
1 MAIN STREET
PID 8-174-1
(SUBJECT TO ARTICLE 97)

N/F
PAUL D. CROSBY
BK/PG 32753/142
6 HASTINGS STREET
PID 8-142-6

1201+00

N/F
RANDALL R. GEBELEIN
BK/PG 46949/193
PB/PL 343/79
8 HASTINGS STREET
PID 8-142-8

EXIST 1949 SHLO LO 3683

PROP ELM STREET BL

MID-HEIGHT GRASSLAND

ELM STREET
(PUBLIC - 33' WIDE)

N/F
YOUNGSMA FAMILY
LIVING TRUST
BK/PG 50698/373
4 HASTINGS STREET
PID 8-142-4

CONTINUED ON SHEET NO. 177

ROUTE 16 (HASTINGS STREET)
(PUBLIC - VARIABLE WIDTH)

N/F
HACKENSON
CORPORATION
BK/PG 43873/254
21 HASTINGS STREET
PID 11-142-21

N/F
STEPHEN M. HACKENSON
BK/PG 57271/275
19 HASTINGS STREET
PID 11-142-19

N/F
MENDON HISTORICAL
SOCIETY OF MENDON
BK/PG 57205/276
PB/PL 191/67
15 HASTINGS STREET
PID 11-142-15

WASHINGTON ST
(PUBLIC - VARIABLE WIDTH)

PROP WASHINGTON ST BL

RET TREES

PROP. ROUTE 16 ℄ STA. 240+06.22 =
PROP. WASHINGTON ST ℄ STA. 500+00.00

RET 3 TREES

REM TREE AND STUMP

N/F
AMBRO
DEVELOPMENT, LLC
BK/PG 50247/87
PB/PL 234/68
25 HASTINGS STREET
PID 11-142-25

501+25

RET TREE

1LD

1ER

R&D TREE AND STUMP

1LD

1ER

TEMP EASEMENT (TYP)

MID-HEIGHT GRASSLAND

N/F
TOWN OF MENDON
(BOARD OF SELECTMEN)
BK/PG 1364/81
(SUB TO ART. 97)

MID-HEIGHT GRASSLAND

REM HEDGE

TEMP EASEMENT (TYP)

REM MULCH
R&D LSA

N/F
HACKENSON CORPORATION
BK/PG 5905/223
PB/PL 422/96
14 HASTINGS STREET
PID 11-142-14

1949 SHLO 3683 BASELINE

OFFSET: 31.74
199.03

RET SHRUB
RET TREE AND STUMP

CONTINUED ON SHEET NO. 175

1949 SHLO 3683 BASELINE

600+00

700+00

EXIST 1949 SHLO LO 3683

MID-HEIGHT GRASSLAND

500+00

REM EXIST TREE AND STUMP

R&D 2 TREES AND STUMPS

PROP. ROUTE 16 ℄ STA. 242+54.52 =
PROP. MAPLE STREET ℄ STA. 700+00.00

TEMP EASEMENT (TYP)

RET TREE

PROP EMERSON ST BL

RET TREE

MID-HEIGHT GRASSLAND

RET TREE
RET TREE
PROP TP (TYP)

PROP MAPLE STREET BL

PROP TREE CLEARING AND GRUBBING

MAPLE STREET
(PUBLIC - 28' WIDE)

703+10

602+17

N/F
ONE EMERSON STREET, INC
BK/PG 28292/227
PB/PL 495/84
1 EMERSON STREET
PID 11-126-1

PROP LIMIT OF SELECTIVE TREE CLEARING & THINNING

EMERSON ST
(PUBLIC - VARIABLE WIDTH)

N/F
CARRIE A. RICE
BK/PG 58593/208
36 MAPLE STREET
PID 11-175-36

N/F
MICHAEL WEBBER AND
TAMARA WEBBER
BK/PG 59405/101
34 MAPLE STREET
PID 11-175-34

N/F
BRUCE B. BARTLETT JR. AND
LYNDSEY H. NICKERSON
BK/PG 46238/274
32 MAPLE STREET
PID 11-175-32

N/F
CORNELIS S. VANDERVALK
AND SUSAN H. VANDERVALK
BK/PG 41997/360
30 MAPLE STREET
PID 11-175-30

0 60 100 200 300

SCALE: 1" = 60'

LEGEND

- EXISITING TREE
- EXISITING VEGETATION TO REMAIN (TYP)
- PROP TREE PROTECTION (TYP)
- PROP SHORT GRASSLAND MIX
- PROP MID-HEIGHT GRASSLAND MIX
- PROP WETLAND SEASONALLY FLOODED MIX

LANDSCAPE NOTES

1. SEE SHEET 174
2. PLANTING OF THE LONDON PLANETREE AND EASTERN REDBUD IS TO TAKE PLACE DURING THE FALL SEASON. THIS IS SUBJECTED TO CHANGE DUE TO BALL & BUNDLE AVAILABILITY, CONTRACTOR TO COORDINATE WITH MASSDOT LANDSCAPE IF AVAILABILITY IS NOT READY.

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LEGEND

- EXISITING TREE
- EXISITING VEGETATION TO REMAIN (TYP)
- PROP TREE PROTECTION (TYP)
- PROP SHORT GRASSLAND MIX
- PROP MID-HEIGHT GRASSLAND MIX
- PROP WETLAND SEASONALLY FLOODED MIX

N

ROUTE 16 (MILFORD STREET)
(PUBLIC – VARIABLE WIDTH)

PROP ROUTE 16 BL

NORTH AVENUE
(PUBLIC – 60' WIDE)

MAIN STREET
(PUBLIC – 60' WIDE)

PROP. ROUTE 16 ℄ STA. 255+62.83 =
PROP. MAIN STREET ℄ STA. 900+00.00

PROP. ROUTE 16 ℄ STA. 255+64.39 =
PROP. NORTH AVENUE ℄ STA. 800+00.00

803+39

PROP NORTH AVENUE BL

N/F
FINO REALTY LLC
BK/PG 49561/396
7 NORTH AVENUE
PID 8–189–7

N/F
FINO REALTY LLC
BK/PG 49514/22
PB/PL 830/80
1 NORTH AVENUE
PID 8–189–1

N/F
TOWN OF MENDON
BK/PG 37146/9
(TRACT I)
PB/PL 536/13
36 MILFORD STREET
PID 9–177–36

"MUDDY BROOK NORTH CONSERVATION AREA"
METACOMET LAND TRUST, INC
CONSERVATION RESTRICTION SUBJECT TO ARTICLE 97
BK/PG 52480/277

N/F
TOWN OF MENDON
(CONSERVATION COMMISSION)
BK/PG 42983/63
20 MILFORD STREET
PID 9–177–20

N/F
WASSIM M. BECHARA
BK/PG 35327/24
3 MILFORD STREET
PID 8–177–3

N/F
PAUL P. GARAGLIANO AND
MARY F. GARAGLIANO
BK/PG 27716/269
5 MILFORD STREET
PID 8–177–5

N/F
KERI ANN LARAMIE
BK/PG 51628/322
7 MILFORD STREET
PID 8–177–7

N/F
PETER G. COFFIN AND
JULIE A. COFFIN
BK/PG 53397/89
11 MILFORD STREET
PID 8–177–11

N/F
ROGER L. WOOD POST #355
AMERICAN LEGION
BK/PG 3064/302
13 MILFORD STREET
PID 8–177–13

N/F
LISA VINCENT TAYLOR AND SHELLEY D. VINCENT IV
BK/PG 59810/52
15 MILFORD STREET
PID 8–177–15

N/F
STEVEN A. HANDLEY
BK/PG 63528/212
9 MILFORD STREET
PID 8–177–9

N/F
KHALID PROPERTIES, LLC
BK/PG 43020/187
PB/PL 268/71
1 MILFORD STREET
PID 8–177–1

N/F
DAVID B. LOWELL AND
JANE E. LOWELL
BK/PG 9394/233
BK/PG 11691/381
4 MAIN STREET
PID 8–174–4

N/F
LISA VINCENT TAYLOR
AND SHELLEY D. VINCENT IV
BK/PG 59810/52
15 MILFORD STREET
PID 8–177–15

EASEMENTS
VERIZON NEW ENGLAND INC.
BK/PG 19818/241
MASSACHUSETTS ELECTRIC CO.
BK/PG 20310/222

N/F
RAYMOND G. ZOOK AND
JANE M. ZOOK
BK/PG 18858/225
PB/PL 168/131
21 MILFORD STREET
PID 9–177–21

MID-HEIGHT GRASSLAND
PROP RET WALL
REM TREE AND STUMP
TEMP EASEMENT (TYP)
R&R STONE BALANCE WALL
PROP TREE CLEARING AND GRUBBING
EXIST 1949 SHLO LO 3683
1949 SHLO 3683 BASELINE
PROP LIMIT OF TREE CLEARING AND GRUBBING
RET TREE
RET LSA
RET HEDGES
RET SHRUBS
R&D SHRUBS
REM SHRUB
PROP TP (TYP)
PROP BMP AREA
WETLAND SEASONALLY FLOODED MIX
RET EXIST BUSH
PROP MAIN STREET ℄
903+68

255 800+00 130 260 135 265 140 270 900+00 901 902 903 801 802

CONTINUED ON SHEET NO. 176
CONTINUED ON SHEET NO. 178

LANDSCAPE NOTES

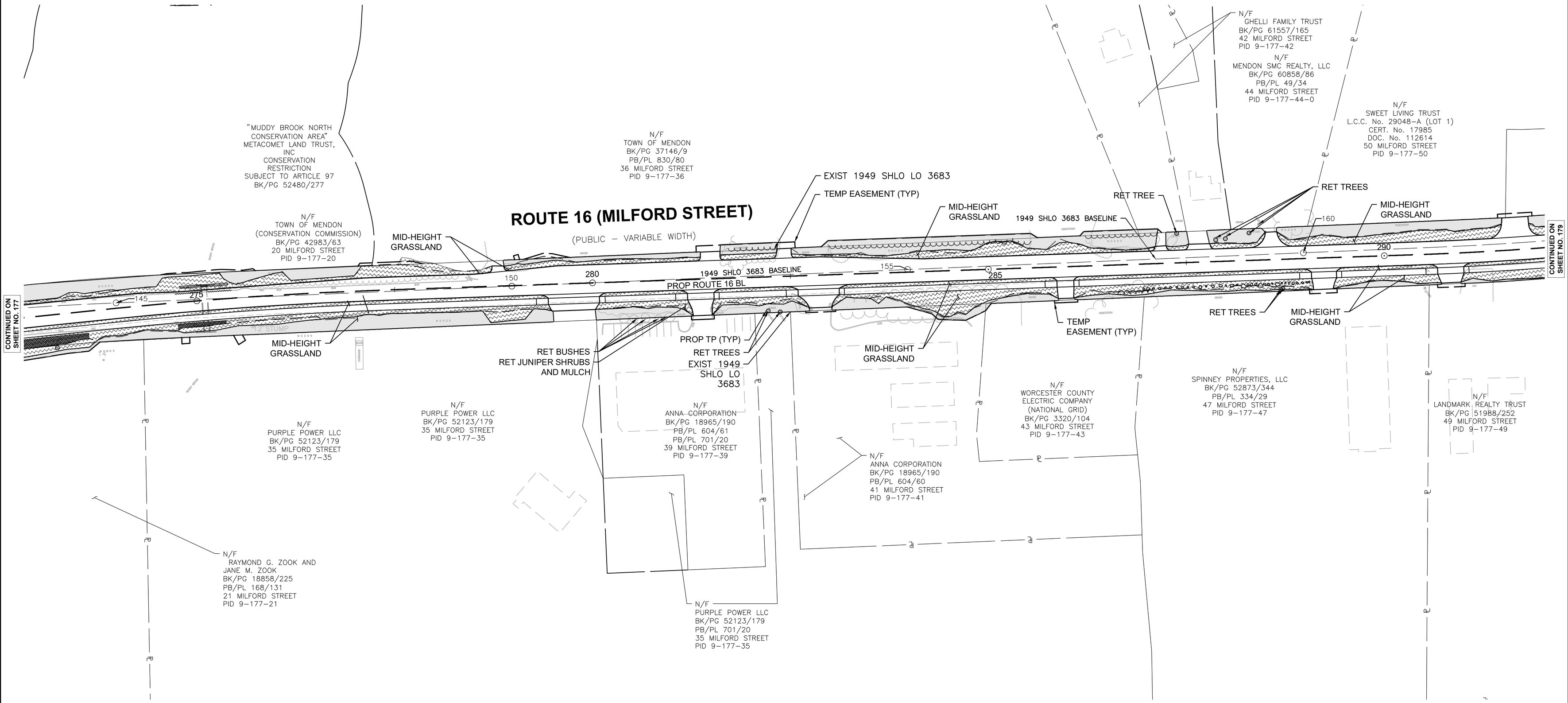
1. SEE SHEET 174

0 60 100 200 300
SCALE: 1" = 60'

608491_HID16(LANDSCAPE PLANS).DWG Plotted on 22-Feb-2024 7:32 AM
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LEGEND

- EXISITING TREE
- EXISITING VEGETATION TO REMAIN (TYP)
- PROP TREE PROTECTION (TYP)
- PROP SHORT GRASSLAND MIX
- PROP MID-HEIGHT GRASSLAND MIX
- PROP WETLAND SEASONALLY FLOODED MIX



LANDSCAPE NOTES

1. SEE SHEET 174

0 60 100 200 300

SCALE: 1" = 60'

608491_HD16(LANDSCAPE PLANS).DWG Plotted on 22-Feb-2024 7:32 AM
Proposal No. 608491-131468
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LEGEND

EXISITING TREE

EXISITING VEGETATION TO REMAIN (TYP)

PROP TREE PROTECTION (TYP)

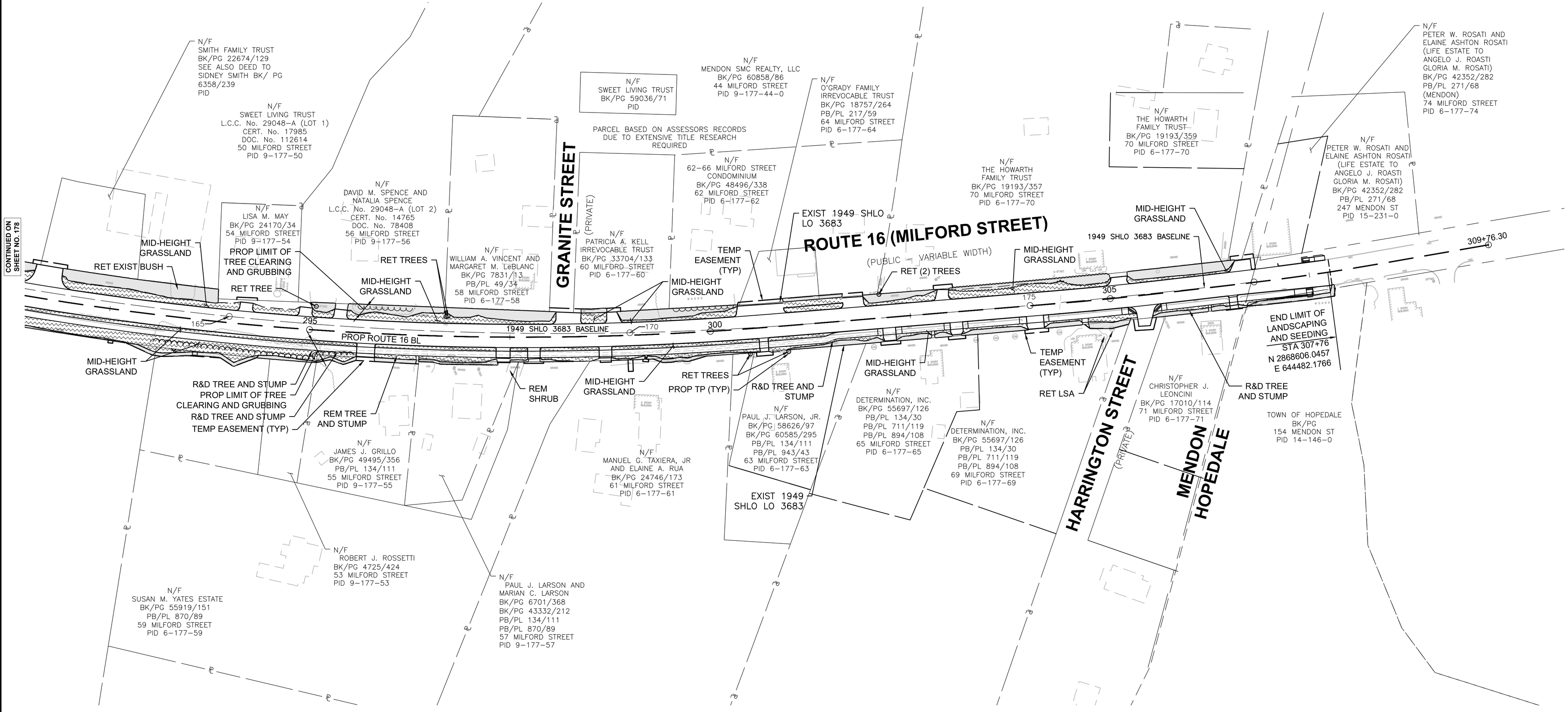
PROP SHORT GRASSLAND MIX

PROP MID-HEIGHT GRASSLAND MIX

PROP WETLAND SEASONALLY FLOODED MIX

LANDSCAPE NOTES

1. SEE SHEET 174



Appendix E – Stormwater Management Report

Uxbridge – Mendon Route 16

Resurfacing and Related Work on Route 16

(100% Submission)

Project No. 608491

Stormwater Report

Prepared for:

Massachusetts Department of Transportation
Highway Division

February 2024

Prepared by
HNTB Corporation

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Appendices

Appendix A

- USGS Project Locus Map
- NOAA Atlas 14 Rainfall Data
- FEMA Flood Zone Map
- NRCS Web Soil Survey Map

Appendix B

- Catchment Area Plans
- Catchment Area Calculations
- Times of Concentration Calculations

Appendix C

- Catch Basin Spread Analysis

Appendix D

- Pipe Sizing Design Analysis

Appendix E

- BMP Design Calculations
- BMP Design HydroCAD
- Recharge, Water Quality Volume, Drawdown Calculations
- Grass Channel Calculations

1. Introduction

1.1 Objectives of Report

This report provides the background and technical information to demonstrate how the Project's proposed drainage and stormwater management systems comply with Chapter 8 Drainage and Erosion Control of the MassDOT Highway Design Guide and the ten Massachusetts Stormwater Standards.

1.2 Project Description

The Massachusetts Department of Transportation (MassDOT) proposes resurfacing and related work along Route 16 in the Town of Mendon from Taft Avenue to the Hopedale town line. Route 16 is a major roadway that runs through Mendon and experiences safety concerns at the intersections and heavy traffic volumes, especially during morning and afternoon rush hours.

The related work includes the addition of a shared use path on the south side of the road, improvements to the existing sidewalk on the north side, along with intersection improvements, two new traffic signals at Hartford Avenue West and Maple Street, and a signal upgrade at North Avenue. The purpose of these roadway improvements is to increase safety and mobility for both vehicles, cyclists, and pedestrians.

The roadway improvements include 11' travel lanes, an 8' shared use path, and a 4' grass buffer. The culvert at Muddy Brook will be repaired to maintain its current function. The project will require modifications to the existing drainage system to align with the new Right-of-Way and provide stormwater management improvements that mitigate the additional impervious surface.

The total project length is roughly two miles. The project begins approximately 200 feet south of Taft Avenue and ends approximately 250 feet north of Harrington Street.

Note: Unless noted otherwise all elevations presented in this document are referenced to the North American Vertical Datum of 1988 (NAVD 88). See the Locus Map provided in Appendix A for project location.

1.3 Stormwater Management and Drainage Design

The following highlights the key general criteria that the project design has followed.

- The proposed stormwater system through the project corridor has been designed to match existing drainage patterns and layout as closely as possible to minimize the

impacts to adjacent properties, resource areas, and existing roadway. Existing catch basins, drain manholes, cross culvert and outfalls have been utilized to the maximum extent practicable.

- Hydraulic pipe sizing calculations have been performed using StormCAD CONNECT Edition Update 3 to ensure all existing and proposed pipes will sufficiently convey the 10-year design storm.
- Spread calculations have been performed to ensure that the width of gutter flow during the 10-year design storm meets the required spread criteria outlined in 2006 MassDOT Project Development & Design Guide, Chapter 8.
- Stormwater runoff from most of the proposed project will drain via gutter to catch basins, enter a pipe conveyance system, and be directed to existing outfalls, as well as infiltration measures to the greatest extent practicable within the project limits.
- Catch basins have been proposed at maximum spacing of 300 ft. Catch basins on the inside of superelevated curves are spaced at a maximum of 250 feet.
- BMP measures have been proposed where appropriate for the project, targeting areas with available right-of-way, and aiming to mimic existing stormwater flow patterns to the greatest extent practicable. These BMP measures, including an infiltration basin, sediment forebays, and grass channels (and further described in Section 3.3) will infiltrate stormwater runoff to recharge groundwater and improve the water quality and reduce peak flows to downstream resources.

1.4 Redevelopment Project

The proposed project is classified as a redevelopment project because the Project provides safety improvements to an active state highway. As a redevelopment project, the project is required to meet the MA DEP Standards 2, 3, 4, and 6 to maximum extent practicable.

For Standard 2, regarding peak flow rate mitigation, larger surface basins will provide a measure of peak flow reduction, but not for a significant portion of project runoff. The small project footprint and right-of-way constraints limited the ability to provide any additional detention for peak rate mitigation.

For Standard 3, regarding ground water recharge, the surface basins will satisfy the Required Recharge Volume in excess of the project site's increase to impervious area for a Target Depth Factor congruent to NRCS Hydrologic soil type B (refer to Appendix E's Required Recharge Volume Calculation). Most of the southern portion of the site is within NRCS Hydrologic soil type C, based on available NRCS Soil Survey mapping, but there are pockets of HSG A, and much of the northern portion of the site is within the boundaries of HSG B. Therefore, HSG soil type B was selected for the overall recharge analysis.

For Standard 4, regarding water quality improvement, the surface basins will satisfy the Required Water Quality Volume for the redevelopment by either effectively storing 1-inch of runoff over the contributing impervious areas or providing TSS removal via conveyance BMPs prior to discharge (refer to Appendix E for Required Recharge Volume Calculation and WQV Delineations). While only a portion of the project discharges to a Special Resource Water (The Muddy Brook is listed as a Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), a water quality volume of 1 inch is assumed for all infiltration measures within the project limits. Surface basins were selected as the designed Best Management Practice because they provide groundwater recharge and improved water quality, which are parameters that have the greatest potential to improve the conditions of the specific adjacent environmental resources.

2 Existing Drainage Conditions

2.1 Topography and Land Use

Route 16 is a 59.9-mile Massachusetts state highway from Route 12 in Webster to the intersection of Route 1A and Route 60 in Revere. In the project area, Route 16 runs east-west from Taft Avenue in Mendon to the Hopedale town line. The land surrounding the project corridor is a mix of residential, commercial, and recreational uses.

2.2 Floodplains / Water Surface Elevations

The project area includes the FEMA 100-year floodplain associated with Muddy Brook. The FEMA Flood Zone Map is included in Appendix A.

2.3 Environmental Resources

Based on an environmental review of the project, multiple natural resource areas were identified within or adjacent to the project area. Three wetlands were identified within the project area and one perennial stream within 200 ft of the project area. The stream crossing was identified as Muddy Brook (STA 275+00). The Muddy Brook is listed as a Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife. The FEMA Flood Zone Map for the Muddy Brook is included in Appendix A. Two open space parcels were identified as being within or adjacent to the project area: Town of Mendon Founders Park located at the Southwest corner of Route 16 and Main Street and the Muddy Brook North Conservation Area bordering the project to the Northwest near the Muddy Brook crossing. An IPaC review for the project identified the Northern Long-eared bat as a federally listed species within the project area. The project does not fall within the area of priority or estimated habitat, but if any tree clearing is included in the project, agency coordination may be required. No Areas of Critical Environmental Concern or vernal pools were identified within

the project corridor. There are several properties identified on the National Registry of Historic Places along the project within the Mendon Center Historic District.

2.4 Surficial Geology Soils

The USDA-NRCS WSS for Hampden County identified 12 mapped soil units within 200 ft of the project area. Three highly erodible soils were identified within the project area. Two hydric soils were identified within the project area. Three soils are classified as predominantly hydric. Hydric soils can be indicative of the presence of wetland communities, which appears to be the case for the project area – flagged wetlands are present in areas of hydric soils.

Hydrologic Soil Groups are determined by the water transmitting soil layer with the lowest saturated hydraulic conductivity and depth to any layer that is more or less water impermeable, or depth to a water table. The least transmissive layer can be any soil horizon that transmits water at a slower rate relative to those horizons above or below it. The slope of the soil surface is not considered when assigning hydrologic soil groups. Refer to Appendix A for the NRCS Web Soil Survey Map.

2.5 Existing Drainage Areas

There are eight existing drainage areas that discharge to existing outfalls located at low points along Route 16. In the first two-thirds of the project, stormwater runoff is captured by a series of catch basins along the gutter line of the road and conveyed through a network of closed pipes. The largest drainage area in the project leads to the Muddy Brook culvert.

3 Proposed Drainage Conditions

3.1 Engineering Methods

Drainage system design is dependent on a calculation of the magnitude, volume, and distribution of storm runoff for a given design storm. A hydrologic and hydraulic analysis was performed for the proposed drainage system. Precipitation data was obtained from the National Oceanic and Atmospheric Association's (NOAA) Atlas 14-point precipitation frequency estimates (See Appendix A). The Rational Method was used to calculate proposed flows and time of concentration was calculated using SCS TR-55 method. In addition to the closed drainage system, the project will also include BMP systems as described in Section 3.3 (and including infiltration basins, grass channels, and sediment forebays) and deep sump catch basins to further enhance the quality of runoff as prescribed in DEP's Stormwater Management Handbook. The Rational Method is used to compute storm runoff flow rates from the contributory areas along the Project corridor, gutter spread widths, flow velocities and hydraulic grade lines for pipe sizing. See Appendix C for pertinent computations pertaining to the placement of catch basins to minimize spread into the travel way and the

sizing of drainage pipes.

3.2 Proposed Drainage Design and Layout

The drainage areas for each inlet were approximated and drawn using AutoCAD 2021. Existing ground contours from the project field survey were used along with GIS contours for off-site areas to establish existing flow patterns and watersheds.

The Rational Method was used to estimate peak stormwater runoff for the 10-year design storm. The Q10 was calculated for the MassDOT roadway drainage requirement and the Q100 was calculated as a design safety check. Time of concentration (Tc) calculations were based on the Technical Release No.55 (TR-55) "Urban Hydrology for Small Watersheds" by the United States Soil Conservation Service (SCS) method for sheet, shallow concentrated and channel flow. Appendix B includes the Catchment Area Plans, Catchment Area Calculations and the Time of Concentration Calculations.

Spread and by-pass flow calculations were performed to ensure that spread width meets the MassDOT standard requirements. The roadway is qualified as urban arterial. The criteria states that the design spread for the 10-year runoff frequency shall be the shoulder width plus 3 feet. A minimum spread width of 6 feet was used. Catch basin layout within the proposed stormwater system has been designed to meet this requirement except where noted in the calculations included in Appendix C.

The storm drain system was analyzed using StormCAD. The hydraulic grade line (HGL) was calculated at each structure to ensure the level of flooding experienced during the design storm event was contained within the structure. The depth to HGL is contained within the structure at all locations. Existing structures downstream of the proposed system were modeled as outfalls. In StormCAD, the outfall would normally be set to "free outfall" which allows the model to calculate the starting depth based on system flow. However, for this design analysis, the outfall condition was set to a tailwater condition with the water elevation being set to the top of the outfall pipe. At outfalls to modelled BMP's, the tailwater elevation was set to the maximum stage elevation for the basin during the 25-year storm. This provides a conservative estimate to account for the potential for existing outfalls to be under water. Appendix D includes the Pipe Sizing calculations.

Existing pipes and structures were maintained to the maximum extent possible. The physical constraints of this existing drainage system limited the flexibility of the proposed design. Proposed pipes were placed at the lowest elevation possible to maximize cover, meet all corresponding existing downstream inverts and adhere to the MassDOT standards.

Assumptions:

- The existing system being retained is in good condition
- The existing system shall remain in use during construction
- The 10-year storm event was the basis for analysis of the closed drainage system
- Time of concentration for all inlets is a minimum of five minutes
- No additional flow shall be intercepted by the system

There are some catch basins where the spread width is beyond the MassDOT standards. In most cases, the exceedance is minimal, or concentrated at low points on side streets where fine grading may still be adjusted. Each instance has been reviewed on an individual basis, and it has been determined the instances of exceedance are minimal, and cannot be significantly improved due to geometric (roadway & driveway layout or grading) constraints.

3.3 Proposed Best Management Practices (BMPs)

The Project proposes the following improvements in stormwater management over the existing conditions:

- Deep sump catch basins
- Sediment Forebay for pre-treatment with an open-graded infiltration basin
- Grassed channels with sediment forebays and checkdams for collection and treatment of runoff

All runoff will flow into deep sump catch basins or vegetated conveyance channels, which is an improvement to existing conditions where there are now only standard catch basins.

There are two open graded BMP areas within project limits. These BMP areas are strategically located at or near areas that are both low point in the roadway profile, and within areas that have the available right of way (and relative lack of established vegetation) to install the proposed best management practices. See Appendix E for the location of the proposed BMPs.

<u>Open Graded Best Management Practices:</u>

All proposed infiltration and BMP measures are modelled using HydroCAD. The model computes the peak discharges through outlets and determines the maximum high water elevation during storm events. This method calculates runoff rate using time of

concentration, curve number, catchment acreage, and 24-hour precipitation for the selected return period and rainfall distribution. Rainfall data for the storm events is estimated from the NOAA Atlas 14, Volume 10, Version 3 Rainfall data. The 2-year, 24 hour storm for the project area is 3.37 inches; the 10-year, 24 hour storm is 5.21 inches; and the 100-year, 24 hour storm is 8.14 inches. The rainfall data is included as Appendix A, and the HydroCAD model is included in Appendix E.

Curve numbers represent the relative permeability of local soil types, with 98 equal to the most impermeable pavement surfaces. Permeable areas are assigned curve numbers according to the hydrologic code of the soil type (A, B, C, or D). the CN values assigned to the contributing pervious areas in each catchment are based on the available SSURGO mapping, and according to the HSG specified for each soil type. Within the areas of focus, this varies from HSG A to HSG C.

Times of concentration demonstrate the longest time that it takes runoff to drain from any point in a catchment area to the discharge. Depending on the characteristics of the flow path, the time of concentration calculation will include some combination of sheet flow, shallow concentrated flow, flow in a pipe, or channel flow. Sheet flow lengths are limited to a maximum 50 feet. The minimum time of concentration is five minutes, or 0.083 hours. Most of the catchment areas within the project are found to have times of concentration less than the minimum five minutes. Time of concentration calculations are included as part of the Drainage Calculations in Appendix B if the time is over the minimum of 5 minutes.

BMP Area 1:

The proposed location for this best management practice is at the western end of the project, near Uxbridge Road's intersection with Hartford Avenue West and stretching from approximately Station 206+00 to Station 209+00, on the north side of the roadway. It consists of a series of surface basins, connected via overflow by a graded grass channel. The most upstream basin is sized as an infiltration basin, including an associated sediment forebay. This location receives the majority of the runoff for this BMP, picking up flow from the existing drain main across the street. The infiltration basin (and associated sediment forebay) is designed to provide recharge and water quality volume for the entire contributing drainage area.

The infiltration basin then overflows to a graded grass channel downstream, which provides further treatment and potential for infiltration for the overflow from the infiltration basin. The grass channel terminates in a small sediment forebay downstream, providing another opportunity for any remaining pollutants to settle and runoff to infiltrate, before discharging either to the closed drainage system (via a catch basin overflow) or overland before

eventually reaching an existing stream. The catch basin is designed as the lower outlet, to minimize runoff to the environmentally sensitive areas surrounding the basin discharge.

BMP Area 2:

The proposed location for this best management practice is at the midpoint of the project, near the existing Muddy Brook Culvert, and stretching from approximately Station 268+25 to 270+50. It consists of a series of two surface basins, connected via overflow by a graded grass channel. The overflow from the second surface basin connects to an existing 'swaled' area that discharges to the wetlands associated with Muddy Brook. This setup generally mimics existing drainage patterns – the existing drain network discharges directly to a vegetated conveyance ditch with rip-rap at the upstream end where runoff currently discharges. BMP Area 2 takes advantage of the existing conditions and upgrades this pattern with sediment forebays and checkdams to slow the velocity of runoff coming through, and allow for additional TSS removal and encouraged recharge.

Given space constraints, and with a large upstream contributing area, neither of the graded basins has adequate size and storage to qualify as infiltration basins or sediment forebays on their own. They are considered as integral to the grass channel, a BMP providing TSS removal up to 50%, as sediment forebays up and downstream.

Grassed channels are not considered by the MassDEP manual to provide recharge. It is anticipated – given the up and downstream forebays, as well as the vegetated nature of the grass channel throughout the limits of the BMP, recharge will be encouraged by this BMP measure. No credit for recharge is included in the overall calculations.

4 Regulatory Compliance

4.1 Clean Water Act

Section 401 of the federal Clean Water Act (CWA) (33 USC 1251-1376), and the regulations that implement the Act, require the enhancement and protection of surface waters from pollution to ensure they are able to support their designated uses. The project is filing a Notice of Intent (NOI) with the Town of Mendon Conservation Commission to describe the project and its impact to sensitive resources protected by the Clean Water Act and the ten Massachusetts Stormwater Standards.

4.2 National Pollutant Discharge Elimination System

The U.S. Environmental Protection Agency (EPA) in partnership with MassDEP administers the National Pollutant Discharge Elimination System (NPDES) permit program, which regulates point source discharges to waters of the United States to control water pollution. The Town of Mendon is authorized to discharge stormwater in accordance with the NPDES Municipal Separate Storm Sewer System (MS4) General Permit. The MS4 General Permit includes numerous requirements to improve stormwater management through public education, upgraded infrastructure, and municipal bylaws. The permit also requires cities to locate and correct any unauthorized sewage discharges into the stormwater system.

Construction for this project site will require a NPDES Construction General Permit, which regulates erosion control, pollution prevention, and stormwater management (including construction dewatering) at construction sites larger than one acre. A Stormwater Pollution Prevention Plan (SWPPP) is required by the NPDES Construction General Permit and must identify potential pollutant source areas and describe measures to be employed for erosion and sedimentation control, temporary stormwater management, dust control, and winter stabilization. The design includes a specification for the contractor to follow when preparing and implementing a SWPPP.

4.3 Massachusetts DEP Stormwater Management Standards

The Massachusetts Stormwater Management Standards are applicable under the Massachusetts Wetlands Protection Act (WPA) regulations (310 CMR 10.00) in 2008. This project will be subject to the WPA because there are jurisdictional wetland resource areas within the project's limit of work. Under the Massachusetts Stormwater Management Standards, this project qualifies as a redevelopment project.

Below is a summary of how the project will comply with the Massachusetts Stormwater Management Standards.

- Standard 1: No New Untreated Discharges or Erosion to Wetlands

The proposed design fully meets the requirements of Standard 1, which states that no new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. With deep sump catch basins proposed for all proposed inlets, no new untreated discharges are proposed by the project. The BMPs included in the proposed stormwater management system are designed in accordance with the Massachusetts DEP Stormwater Handbook.

- Standard 2: Peak Rate Attenuation

The project meets Standard 2 only to the maximum extent practicable. This Standard states that stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. The proposed BMP measures will reduce peak flows during small storm events but will provide only negligible reduction of peak flows during larger storm events. The right-of-way constraints limit the ability to provide any additional detention to fully meet the requirements of the standard. Pipe sizing calculations are included in Appendix D to demonstrate that the design provides a closed drainage network with capacity to convey the stormwater runoff from the project. The wetland buffer between the project site and the nearest flowing water body is sufficient to dissipate any potential flow increases leaving the project site.

- Standard 3: Stormwater Recharge

The proposed design fully meets the requirements of Standard 3 which states that loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater BMPs, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

For discharge to the outfall to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to at least 25% is provided via a deep sump catch basins. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for BMP management and recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standards 3 and 6.

The project adds approximately 1.53 acres of impervious surface area. While only a portion of the project is within HSG B soils, the Required Recharge Volume is conservatively assumed to apply for HSG B soils at all infiltration measures within project limits, resulting in a Required Recharge Volume of 1,943 cubic feet. The surface infiltration basin includes a forebay for pretreatment that is sized for 0.1 inch of rainfall over the impervious area that drains to the basin. Static method calculations are included in Appendix E to demonstrate that the surface infiltration basin at BMP 1 and downstream sediment forebay at BMP 1 recharge 2,163 cubic feet of runoff, exceeding the Required Recharge Volume for the project's increase in impervious area. The appendix also includes Drawdown Calculations to demonstrate that the basins will drain in less than the maximum 72 hours allowed.

- Standard 4: Water Quality

The project meets Standard 4 only to the maximum extent practicable. Standard 4 states that stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:

- Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

- Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and

- Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook

The Infiltration and BMP Basin Sizing Calculations are included in Appendix E. Deep sump catch basins, or a gutter inlet connecting to a manhole with a sump, are provided at all locations where a new catch basin is proposed. The portion of the project that drains to the BMPs includes 2.64 acres of impervious area, almost double the 1.53 acres of impervious area added by the project. All BMP areas are designed to provide at least 63% TSS removal, discharging less than the remainder of the project which uses only deep sump catch basins to remove 25% TSS. Therefore, the weighted average TSS removal is less than 80%.

However, this project improves upon existing conditions by providing more water quality treatment than the current drainage system provides, by providing 68% TSS removal for an impervious area larger than the impervious area added by the project. The majority of the treatment trains for BMP areas provide TSS removal in excess of 80%, and a table showing the TSS removal for each BMP treatment train is included in the table below. A Long Term Pollution Prevention Plan is not included because the design requires no post-construction

actions beyond MassDOT's standard operating procedures.

Catchment	Impervious Area (SF)	WQ Treatment (%)
BMP 2 Road	97,190	63%
BMP 1 Road	16,174	94%
BMP 1 Basin 1 Direct Flow	1,544	93%
	Weighted Average:	68%

It is further noted that the downstream basin of BMP 2 (the BMP with the largest contributing drainage area), after conveying through the designed grass channel, ultimately discharges to an existing grassed conveyance ditch that will remain in place beyond the grading limits of BMP 2. While no credit is claimed in the calculation for treatment by the existing swale, conveyance in natural grass channels has additional potential stormwater quality and recharge benefits.

For discharge to the outfall to the Muddy Brook (designated as Coldwater Fishery Resource by the Massachusetts Division of Fisheries and Wildlife), pretreatment to at least 25% is provided via a deep sump catch basins. Given constraints in grading, available right-of-way, and minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for BMP management and recharge could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standards 4 and 6.

All measures designed for infiltration are designed for the 1-inch water quality volume, and all conveyance measures with TSS removal credit are designed for the water quality flow resulting from a 1-inch, 24-hour storm. Calculations demonstrating compliance with the standards in the MassDEP BMP manual for all measures removing suspended solids from runoff are included in Appendix E.

- Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The proposed design fully meets the requirements of Standard 5, which states that for land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. None of the land uses within the project limits have higher potential pollutant loads.

- Standard 6: Critical Areas

As a Redevelopment Project, the project meets the 44% TSS removal pretreatment requirements of Standard 6 only to the maximum extent practicable, but fully meets the 1-inch water quality volume requirement for all designed infiltration areas. The grassed channel in BMPs 1 and 2 are designed for the appropriate water quality flow draining to each, as well as the other standards outlined in the MassDEP BMP Manual. Standard 6 states that stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas. Portions of the project discharge to a Coldwater Fishery Resource as designated by the Massachusetts Division of Fisheries and Wildlife (Muddy Brook). Given constraints in grading, available right-of-way, and the goal of minimizing the disturbance to adjacent jurisdictional resource and buffer areas, provision for specified BMP measures, including pretreatment, infiltration, and TSS removal could not be provided for all discharges to the Muddy Brook. The redevelopment standards provide for compliance to the maximum extent practicable for Standard 6.

- Standard 7: Redevelopment Projects

Standard 7 states that a redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges would comply with Standard 1 only to the maximum extent practicable. The proposed redevelopment project would also comply with Standards 2, 3, 4 and 6 to the maximum extent practicable, as noted with project restraints. All other requirements of the Stormwater Management Standards will be met by the proposed work and improve existing conditions.

- Standard 8: Construction Period Pollution Prevention, Erosion/Sed. Controls

This project sites fully complies with Standard 8, which states that a plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

The project site will obtain coverage under the Massachusetts NPDES Construction General Permit. As required under this permit, a SWPPP would be developed and submitted before land disturbance begins. The SWPPP will be developed by the contractor according the MassDOT's specifications and will include the following:

o Construction period pollution prevention measures;

o Erosion and sedimentation control plan drawings;

o Detailed drawings and specifications for erosion control BMPs, and sizing calculations;

o An operation and maintenance plan for erosion and sedimentation controls;

o An inspection schedule; and

o A maintenance schedule

- Standard 9: Operation and Maintenance Plan

The proposed design fully meets the requirements of Standard 9, which states that a long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed. A project-specific Post Construction Operation and Maintenance Plan is not included because the design requires no post-construction actions beyond MassDOT's standard maintenance activities.

- Standard 10: Prohibition of Illicit Discharges

The project site is designed to fully comply with Standard 10, which states that all illicit discharges to the stormwater management system are prohibited. The proposed project elements would be designed to be in full compliance with current standards. Any property owners identified with illicit connections will be contacted by MassDOT and disconnected from the MassDOT system unless the property owner obtains the required permits for the connection. An Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to post-construction BMPs.

5 Conclusion

The proposed stormwater system will collect stormwater runoff in proposed and existing catch basin structures, and convey flow through proposed and existing pipe, which ultimately discharge to existing outfalls. No new outfall locations for this project are proposed, though some are adjusted in location. The existing drainage system, within project limits, is being utilized to the maximum extent practicable to avoid disturbance to the existing roadway drainage system. The stormwater system will adequately convey the design storm through project limits. Pipe sizing and catch basin spread have been designed and confirmed to be within allowable limits in order to meet the requirements of the Mass Highway Drainage Design Guide Chapter 8, other than where specifically noted. Two BMPs, designed for infiltration and/or conveyance and in accordance with the Mass DEP Stormwater Handbook, are proposed to provide water quality treatment and recharge to stormwater runoff. Additionally, deep sump catch basins are proposed to provide an added level of sediment removal within the drainage networks. These proposed drainage design features provide an improvement over existing drainage conditions.

Appendix A

USGS Project Locus Map
NOAA Atlas 14 Rainfall Rainfall Data
FEMA Flood Zone Map
NRCS Web Soil Survey Map

USGS science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

BLACKSTONE QUADRANGLE
MASSACHUSETTS - RHODE ISLAND
7.5-MINUTE SERIES


Project Locus
-71.6250°
-71.5000°
42.1250°
42.0000°
284000mE
292000mE
4666000mN
4653000mN
Ellis Pond
West River Pond
Merrington Pond
Long Meadow
West Hill
Cedar Swamp
Blackstone River
Pond Hill
Rock Meadow Brook
Nipmuck Pond
Rice City Pond
Pout Pond
Calumet Pond
Meadow Brook
Wheelockville
Centerville
Locust Hill Cem
White City
Spindleville
Spindleville Pond
Mill Brook
Mumby Brook
Chartles River
South Hopedale Cem
Hopedale Industrial Park Airport
Mendon
George Cem
Friends Cem
Town Cem
Gaskill Cem
Wood Cem
Wilkinson Brook
South Milford
Swandale Cem
Bassett Cem
Daniels Cem
Spring Brook
Ohio Brook
Round Meadow Brook
Inman Hill
Quisset Hill
Mill River
Pine Hill Cem
Chestnut Hill
Quisset Brook
Fish Pond
Duck Pond
Daniels Hill
Candlewood Hill
Quaker Meeting Cem
Walsh Pond
East Blackstone
Forge Pond
Quaker Stream
Chestnut Hill Meeting House
Chestnut Hill Meeting House Cem
Albee Cem
Fox Brook
Estey Hill
Waterbug Hill
Crane Pond
Briggs Pond
Darling Cem
Norden Cem
Old Millville Cem
Millville
Alabama Brook
Reilly Pond
Red Bridge
Blackstone Cem
Saint Stanislaus Cem
Saint Charles Cem
Saint Michaels Cem
Ironstone Reservoir
Coleman Pond
Mascufield Pond
Quaker City Cem
Almshouse Cem
Wilson Lot Cem
Millville Cem
Captain James Buxton Cem
Buxton Cem
Slius Comstock Lot Cem
Slatersville
Slatersville Cem
Darling Brook
Pratt Pond
Waterford
WOONSOCKET
State Park Beach
Social
Court Street Bridge
Harris Pond
Oak Hill Cem
Precious Blood Cem
Goblin Rock
MASSACHUSETTS
RHODE ISLAND
WORCESTER CO
PROVIDENCE CO
Southern New England Trunkline Trl
Blackstone River Bikeway Trl
Tri Rivers
Blackstone Gorge
Mill River
Quinsigamond River
Chartles River
Bellingham St
Hartford Ave E
Hartford Ave W
Mendon St
Uxbridge Rd
Providence St
Millville Rd
Old Millville Rd
Old Chestnut Hill Rd
Old Sawmill Rd
Old Dudley Rd
Old Chocolate Rd
Old Grist Rd
Old Colony Rd
Old Farm Rd
Old Elmwood Ave
Old Mill Rd
Old Mill Ln
Old Oak Rd
Old Ridge Rd
Old Stone Rd
Old Tavern Rd
Old Wagon Rd
Old Wood Rd
Old Worcester Rd
Old Wrentham Rd
Old Yard Rd
Old Yew Rd
Old Zion Rd
Old Zion Hill Rd
Old Zion Hill Rd
Old Zion Hill

NOAA Atlas 14, Volume 10, Version 3
Location name: Mendon, Massachusetts, USA*
Latitude: 42.1073°, Longitude: -71.5533°
Elevation: 382.44 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.01** (3.14-5.02)	**4.80** (3.77-6.02)	**6.10** (4.78-7.68)	**7.19** (5.59-9.11)	**8.68** (6.52-11.5)	**9.80** (7.21-13.3)	**11.0** (7.82-15.4)	**12.3** (8.29-17.7)	**14.1** (9.16-21.2)	**15.6** (9.86-23.9)
10-min	**2.84** (2.23-3.55)	**3.40** (2.67-4.27)	**4.33** (3.38-5.45)	**5.09** (3.96-6.45)	**6.15** (4.62-8.15)	**6.95** (5.11-9.41)	**7.78** (5.54-10.9)	**8.69** (5.87-12.6)	**9.99** (6.49-15.0)	**11.0** (6.99-16.9)
15-min	**2.22** (1.75-2.79)	**2.67** (2.09-3.35)	**3.39** (2.65-4.27)	**3.99** (3.10-5.06)	**4.82** (3.62-6.39)	**5.44** (4.00-7.38)	**6.10** (4.34-8.58)	**6.82** (4.60-9.85)	**7.84** (5.08-11.7)	**8.66** (5.48-13.3)
30-min	**1.52** (1.20-1.91)	**1.83** (1.43-2.29)	**2.33** (1.82-2.93)	**2.74** (2.13-3.48)	**3.32** (2.49-4.39)	**3.75** (2.76-5.08)	**4.20** (2.99-5.90)	**4.69** (3.17-6.78)	**5.39** (3.50-8.09)	**5.96** (3.77-9.13)
60-min	**0.965** (0.758-1.21)	**1.16** (0.911-1.46)	**1.48** (1.16-1.86)	**1.75** (1.36-2.21)	**2.11** (1.59-2.80)	**2.39** (1.75-3.23)	**2.67** (1.90-3.76)	**2.99** (2.02-4.32)	**3.44** (2.23-5.15)	**3.80** (2.40-5.81)
2-hr	**0.617** (0.488-0.768)	**0.746** (0.590-0.930)	**0.957** (0.754-1.20)	**1.13** (0.886-1.42)	**1.37** (1.04-1.81)	**1.55** (1.15-2.10)	**1.74** (1.25-2.45)	**1.96** (1.33-2.81)	**2.27** (1.48-3.38)	**2.53** (1.60-3.84)
3-hr	**0.474** (0.377-0.588)	**0.574** (0.456-0.713)	**0.739** (0.583-0.920)	**0.874** (0.687-1.10)	**1.06** (0.807-1.40)	**1.20** (0.894-1.62)	**1.35** (0.975-1.89)	**1.52** (1.03-2.18)	**1.77** (1.16-2.63)	**1.98** (1.26-3.00)
6-hr	**0.304** (0.243-0.375)	**0.369** (0.294-0.455)	**0.475** (0.377-0.588)	**0.562** (0.445-0.701)	**0.683** (0.523-0.894)	**0.773** (0.579-1.04)	**0.870** (0.633-1.22)	**0.985** (0.671-1.40)	**1.16** (0.758-1.71)	**1.31** (0.833-1.96)
12-hr	**0.191** (0.154-0.234)	**0.232** (0.186-0.284)	**0.298** (0.239-0.367)	**0.354** (0.281-0.438)	**0.430** (0.331-0.560)	**0.486** (0.367-0.649)	**0.547** (0.402-0.764)	**0.622** (0.425-0.877)	**0.736** (0.483-1.08)	**0.834** (0.534-1.24)
24-hr	**0.115** (0.093-0.140)	**0.140** (0.114-0.171)	**0.182** (0.147-0.223)	**0.217** (0.174-0.267)	**0.265** (0.206-0.344)	**0.300** (0.228-0.399)	**0.339** (0.251-0.472)	**0.387** (0.265-0.542)	**0.461** (0.303-0.669)	**0.525** (0.337-0.777)
2-day	**0.065** (0.053-0.079)	**0.081** (0.066-0.098)	**0.106** (0.086-0.129)	**0.128** (0.103-0.156)	**0.157** (0.122-0.202)	**0.178** (0.136-0.236)	**0.202** (0.150-0.279)	**0.231** (0.159-0.322)	**0.277** (0.183-0.400)	**0.317** (0.204-0.467)
3-day	**0.047** (0.039-0.057)	**0.059** (0.048-0.071)	**0.077** (0.063-0.093)	**0.092** (0.075-0.112)	**0.113** (0.089-0.145)	**0.129** (0.099-0.169)	**0.146** (0.109-0.201)	**0.167** (0.115-0.231)	**0.200** (0.132-0.287)	**0.229** (0.148-0.335)
4-day	**0.038** (0.031-0.046)	**0.047** (0.039-0.056)	**0.061** (0.050-0.074)	**0.073** (0.059-0.089)	**0.090** (0.070-0.115)	**0.102** (0.078-0.133)	**0.115** (0.086-0.158)	**0.131** (0.091-0.181)	**0.157** (0.104-0.225)	**0.180** (0.116-0.262)
7-day	**0.026** (0.022-0.031)	**0.032** (0.026-0.038)	**0.040** (0.033-0.048)	**0.048** (0.039-0.057)	**0.058** (0.045-0.073)	**0.065** (0.050-0.084)	**0.073** (0.054-0.099)	**0.083** (0.057-0.113)	**0.097** (0.065-0.138)	**0.110** (0.071-0.159)
10-day	**0.021** (0.018-0.025)	**0.025** (0.021-0.030)	**0.031** (0.026-0.038)	**0.037** (0.030-0.044)	**0.044** (0.035-0.055)	**0.049** (0.038-0.064)	**0.055** (0.041-0.074)	**0.062** (0.043-0.084)	**0.072** (0.048-0.102)	**0.080** (0.052-0.116)
20-day	**0.015** (0.012-0.018)	**0.017** (0.014-0.020)	**0.020** (0.017-0.024)	**0.023** (0.019-0.028)	**0.027** (0.021-0.033)	**0.030** (0.023-0.038)	**0.033** (0.024-0.043)	**0.036** (0.025-0.049)	**0.040** (0.027-0.057)	**0.044** (0.029-0.063)
30-day	**0.012** (0.010-0.015)	**0.014** (0.012-0.016)	**0.016** (0.013-0.019)	**0.018** (0.015-0.021)	**0.021** (0.016-0.025)	**0.023** (0.017-0.028)	**0.025** (0.018-0.032)	**0.027** (0.019-0.036)	**0.029** (0.020-0.041)	**0.031** (0.020-0.045)
45-day	**0.010** (0.009-0.012)	**0.011** (0.009-0.013)	**0.013** (0.011-0.015)	**0.014** (0.012-0.017)	**0.016** (0.013-0.019)	**0.017** (0.013-0.022)	**0.019** (0.014-0.024)	**0.020** (0.014-0.027)	**0.022** (0.015-0.030)	**0.023** (0.015-0.032)
60-day	**0.009** (0.008-0.010)	**0.010** (0.008-0.011)	**0.011** (0.009-0.013)	**0.012** (0.010-0.014)	**0.013** (0.011-0.016)	**0.014** (0.011-0.018)	**0.015** (0.011-0.020)	**0.016** (0.012-0.022)	**0.017** (0.012-0.024)	**0.018** (0.012-0.026)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

NOAA Atlas 14, Volume 10, Version 3
Location name: Mendon, Massachusetts, USA*
Latitude: 42.1073°, Longitude: -71.5533°
Elevation: 382.44 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.334** (0.262-0.418)	**0.400** (0.314-0.502)	**0.508** (0.398-0.640)	**0.599** (0.466-0.759)	**0.723** (0.543-0.959)	**0.817** (0.601-1.11)	**0.915** (0.652-1.29)	**1.02** (0.691-1.48)	**1.18** (0.763-1.76)	**1.30** (0.822-1.99)
10-min	**0.473** (0.371-0.592)	**0.567** (0.445-0.711)	**0.721** (0.564-0.908)	**0.849** (0.660-1.08)	**1.02** (0.770-1.36)	**1.16** (0.851-1.57)	**1.30** (0.923-1.82)	**1.45** (0.978-2.09)	**1.67** (1.08-2.50)	**1.84** (1.17-2.82)
15-min	**0.556** (0.437-0.697)	**0.667** (0.523-0.837)	**0.848** (0.663-1.07)	**0.998** (0.776-1.26)	**1.21** (0.906-1.60)	**1.36** (1.00-1.85)	**1.52** (1.09-2.15)	**1.70** (1.15-2.46)	**1.96** (1.27-2.94)	**2.17** (1.37-3.32)
30-min	**0.760** (0.598-0.953)	**0.914** (0.717-1.15)	**1.17** (0.911-1.47)	**1.37** (1.07-1.74)	**1.66** (1.25-2.20)	**1.87** (1.38-2.54)	**2.10** (1.50-2.95)	**2.35** (1.58-3.39)	**2.70** (1.75-4.04)	**2.98** (1.89-4.56)
60-min	**0.965** (0.758-1.21)	**1.16** (0.911-1.46)	**1.48** (1.16-1.86)	**1.75** (1.36-2.21)	**2.11** (1.59-2.80)	**2.39** (1.75-3.23)	**2.67** (1.90-3.76)	**2.99** (2.02-4.32)	**3.44** (2.23-5.15)	**3.80** (2.40-5.81)
2-hr	**1.23** (0.976-1.54)	**1.49** (1.18-1.86)	**1.91** (1.51-2.40)	**2.26** (1.77-2.85)	**2.75** (2.08-3.62)	**3.11** (2.30-4.19)	**3.49** (2.50-4.89)	**3.92** (2.66-5.63)	**4.54** (2.96-6.76)	**5.06** (3.21-7.69)
3-hr	**1.42** (1.13-1.77)	**1.73** (1.37-2.14)	**2.22** (1.75-2.76)	**2.63** (2.06-3.29)	**3.19** (2.42-4.19)	**3.61** (2.68-4.86)	**4.06** (2.93-5.68)	**4.57** (3.11-6.54)	**5.33** (3.47-7.90)	**5.96** (3.79-9.02)
6-hr	**1.82** (1.46-2.24)	**2.21** (1.76-2.72)	**2.84** (2.26-3.52)	**3.37** (2.66-4.20)	**4.09** (3.13-5.36)	**4.63** (3.47-6.21)	**5.21** (3.79-7.29)	**5.90** (4.02-8.38)	**6.94** (4.54-10.2)	**7.82** (4.99-11.8)
12-hr	**2.30** (1.85-2.82)	**2.79** (2.24-3.42)	**3.60** (2.88-4.42)	**4.26** (3.39-5.27)	**5.18** (3.99-6.75)	**5.86** (4.42-7.82)	**6.59** (4.84-9.20)	**7.49** (5.12-10.6)	**8.87** (5.82-13.0)	**10.0** (6.43-15.0)
24-hr	**2.75** (2.23-3.35)	**3.37** (2.73-4.10)	**4.38** (3.53-5.35)	**5.21** (4.17-6.41)	**6.36** (4.93-8.24)	**7.21** (5.48-9.59)	**8.14** (6.02-11.3)	**9.28** (6.37-13.0)	**11.1** (7.28-16.1)	**12.6** (8.08-18.7)
2-day	**3.13** (2.55-3.78)	**3.88** (3.16-4.69)	**5.10** (4.14-6.19)	**6.12** (4.93-7.47)	**7.52** (5.87-9.69)	**8.55** (6.54-11.3)	**9.68** (7.21-13.4)	**11.1** (7.64-15.4)	**13.3** (8.79-19.2)	**15.2** (9.81-22.4)
3-day	**3.41** (2.79-4.10)	**4.22** (3.45-5.08)	**5.54** (4.51-6.70)	**6.64** (5.37-8.07)	**8.15** (6.38-10.5)	**9.26** (7.10-12.2)	**10.5** (7.82-14.4)	**12.0** (8.29-16.6)	**14.4** (9.52-20.7)	**16.5** (10.6-24.1)
4-day	**3.67** (3.01-4.40)	**4.51** (3.70-5.42)	**5.89** (4.81-7.10)	**7.03** (5.71-8.53)	**8.61** (6.75-11.0)	**9.76** (7.50-12.8)	**11.0** (8.24-15.1)	**12.6** (8.73-17.4)	**15.1** (9.99-21.6)	**17.2** (11.1-25.1)
7-day	**4.40** (3.63-5.25)	**5.30** (4.37-6.33)	**6.77** (5.55-8.11)	**7.99** (6.51-9.63)	**9.66** (7.61-12.2)	**10.9** (8.40-14.2)	**12.3** (9.15-16.6)	**13.9** (9.64-19.0)	**16.4** (10.9-23.2)	**18.5** (12.0-26.8)
10-day	**5.10** (4.22-6.06)	**6.03** (4.98-7.17)	**7.55** (6.22-9.01)	**8.81** (7.20-10.6)	**10.5** (8.31-13.3)	**11.8** (9.12-15.2)	**13.2** (9.85-17.7)	**14.8** (10.3-20.3)	**17.2** (11.5-24.4)	**19.3** (12.5-27.8)
20-day	**7.20** (6.00-8.49)	**8.17** (6.80-9.66)	**9.77** (8.10-11.6)	**11.1** (9.14-13.2)	**12.9** (10.2-16.0)	**14.3** (11.0-18.1)	**15.7** (11.7-20.7)	**17.3** (12.1-23.4)	**19.4** (13.0-27.3)	**21.1** (13.8-30.3)
30-day	**8.93** (7.48-10.5)	**9.94** (8.31-11.7)	**11.6** (9.64-13.7)	**13.0** (10.7-15.4)	**14.8** (11.8-18.3)	**16.3** (12.6-20.5)	**17.7** (13.1-23.0)	**19.2** (13.5-25.8)	**21.1** (14.2-29.5)	**22.6** (14.7-32.2)
45-day	**11.1** (9.32-13.0)	**12.1** (10.2-14.2)	**13.8** (11.6-16.3)	**15.3** (12.7-18.0)	**17.2** (13.7-21.0)	**18.7** (14.5-23.3)	**20.2** (14.9-25.9)	**21.6** (15.2-28.9)	**23.3** (15.7-32.3)	**24.4** (16.0-34.7)
60-day	**12.9** (10.9-15.1)	**14.0** (11.8-16.3)	**15.7** (13.2-18.4)	**17.2** (14.3-20.3)	**19.2** (15.3-23.4)	**20.8** (16.1-25.8)	**22.3** (16.5-28.4)	**23.6** (16.7-31.4)	**25.1** (17.0-34.7)	**26.1** (17.0-36.9)

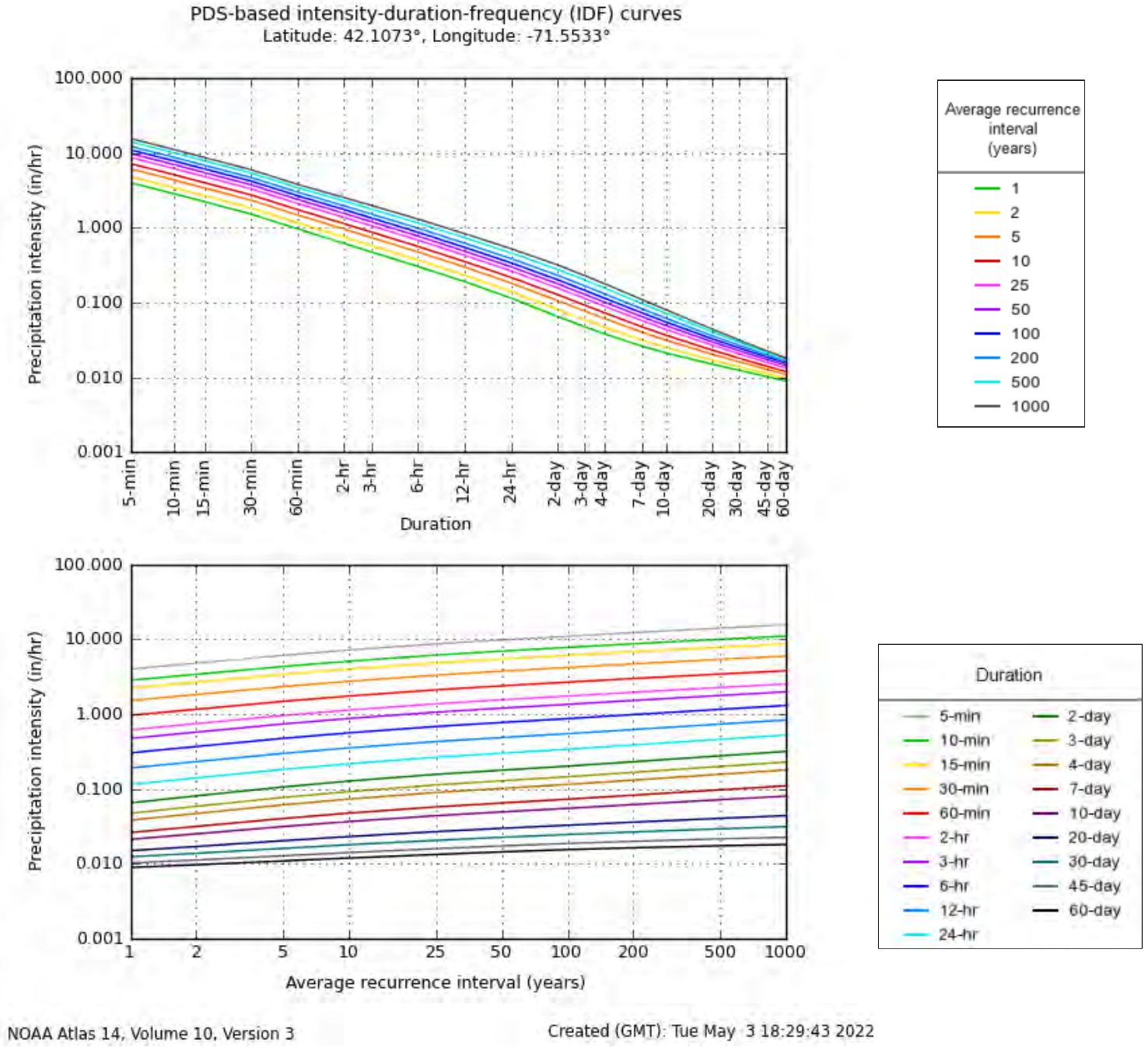
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical



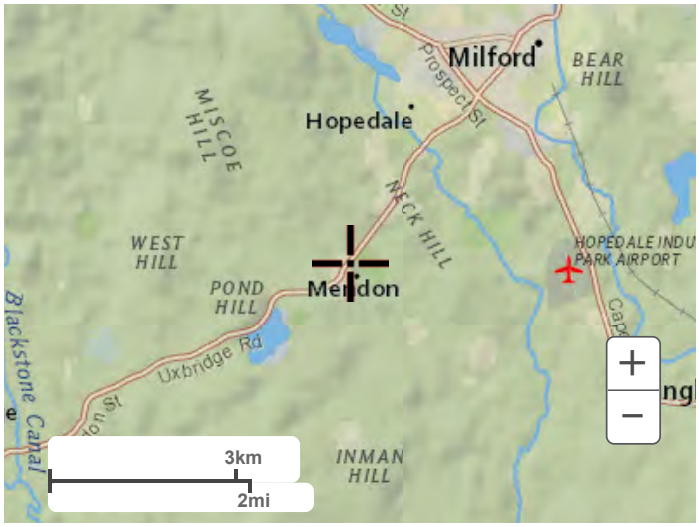
NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Tue May 3 18:29:43 2022

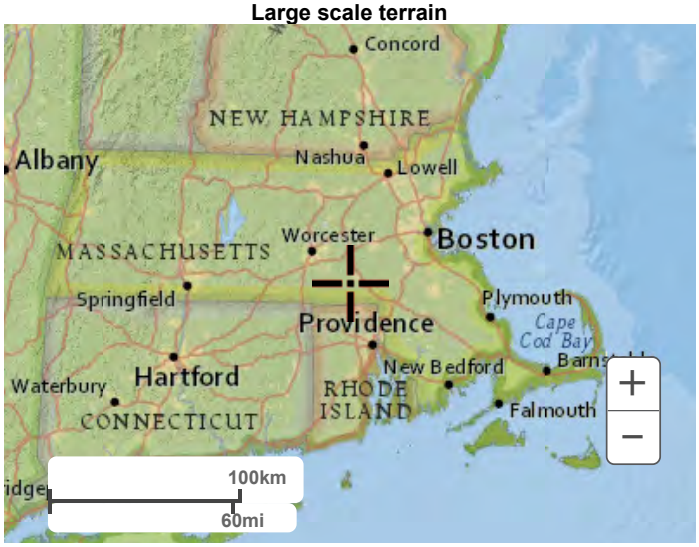
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Maps & aerials

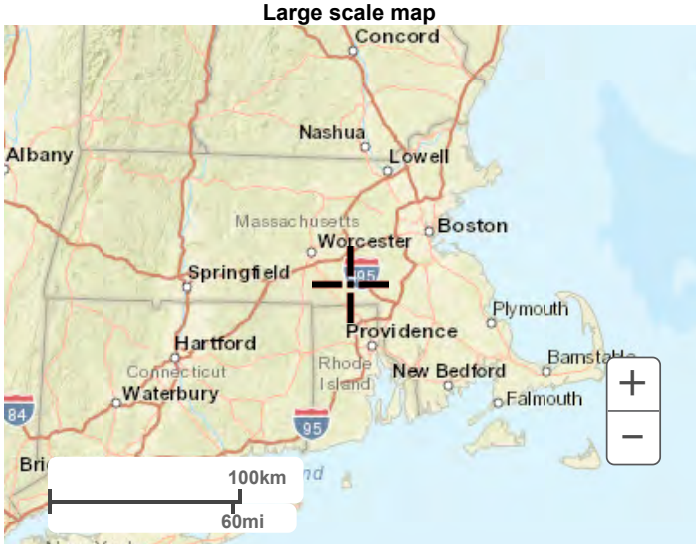
Small scale terrain



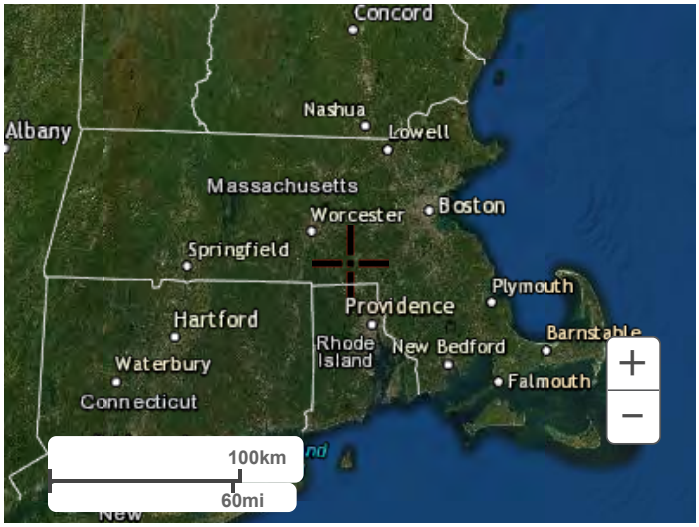
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOTES TO USERS

is for use in administering the National Flood Insurance Program. It does ssarily identify all areas subject to flooding, particularly from local drainage of small size. The **community map repository** should be consulted for pdated or additional flood hazard information.

more detailed information in areas where **Base Flood Elevations** (BFEs) **odways** have been determined, users are encouraged to consult the Flood nd Floodway Data and/or Summary of Stillwater Elevations tables contained Flood Insurance Study (FIS) Report that accompanies this FIRM. Users e aware that BFEs shown on the FIRM represent rounded whole-foot . These BFEs are intended for flood insurance rating purposes only and t be used as the sole source of flood elevation information. Accordingly, ation data presented in the FIS Report should be utilized in conjunction with for purposes of construction and/or floodplain management.

Base Flood Elevations shown on this map apply only landward of 0.0' erican Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be t coastal flood elevations are also provided in the Summary of Stillwater table in the Flood Insurance Study Report for this jurisdiction. Elevations the Summary of Stillwater Elevations table should be used for construction odplain management purposes when they are higher than the elevations this FIRM.

es of the **floodways** were computed at cross sections and interpolated ross sections. The floodways were based on hydraulic considerations with requirements of the National Flood Insurance Program. Floodway widths pertinent floodway data are provided in the Flood Insurance Study Report diction.

reas not in Special Flood Hazard Areas may be protected by **flood control s**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance ort for information on flood control structures for this jurisdiction.

ection used in the preparation of this map was Massachusetts State Plane Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 . Differences in datum, spheroid, projection or UTM zones used in the n of FIRMs for adjacent jurisdictions may result in slight positional s in map features across jurisdiction boundaries. These differences do not accuracy of this FIRM.

vations on this map are referenced to the North American Vertical Datum of ese flood elevations must be compared to structure and ground elevations d to the same **vertical datum**. For information regarding conversion the National Geodetic Vertical Datum of 1929 and the North American Datum of 1988, visit the National Geodetic Survey website at ngs.noaa.gov or contact the National Geodetic Survey at the following

rmation Services
NGS12
Geodetic Survey
#9202
e-West Highway
ng, Maryland 20910-3282
-3242

current elevation, description, and/or location information for **bench marks** this map, please contact the Information Services Branch of the National Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

p information shown on this FIRM was derived from digital orthophotography. files were provided in digital format by Massachusetts Geographic n System (MassGIS). Ortho imagery was produced at a scale of 1:5,000 tography dated April 2005.

e baselines depicted on this map represent the hydraulic modeling baselines n the flood profiles in the FIS report. As a result of improved topographic data, e **baselines**, in some cases, may deviate significantly from the channel or appear outside the SFHA.

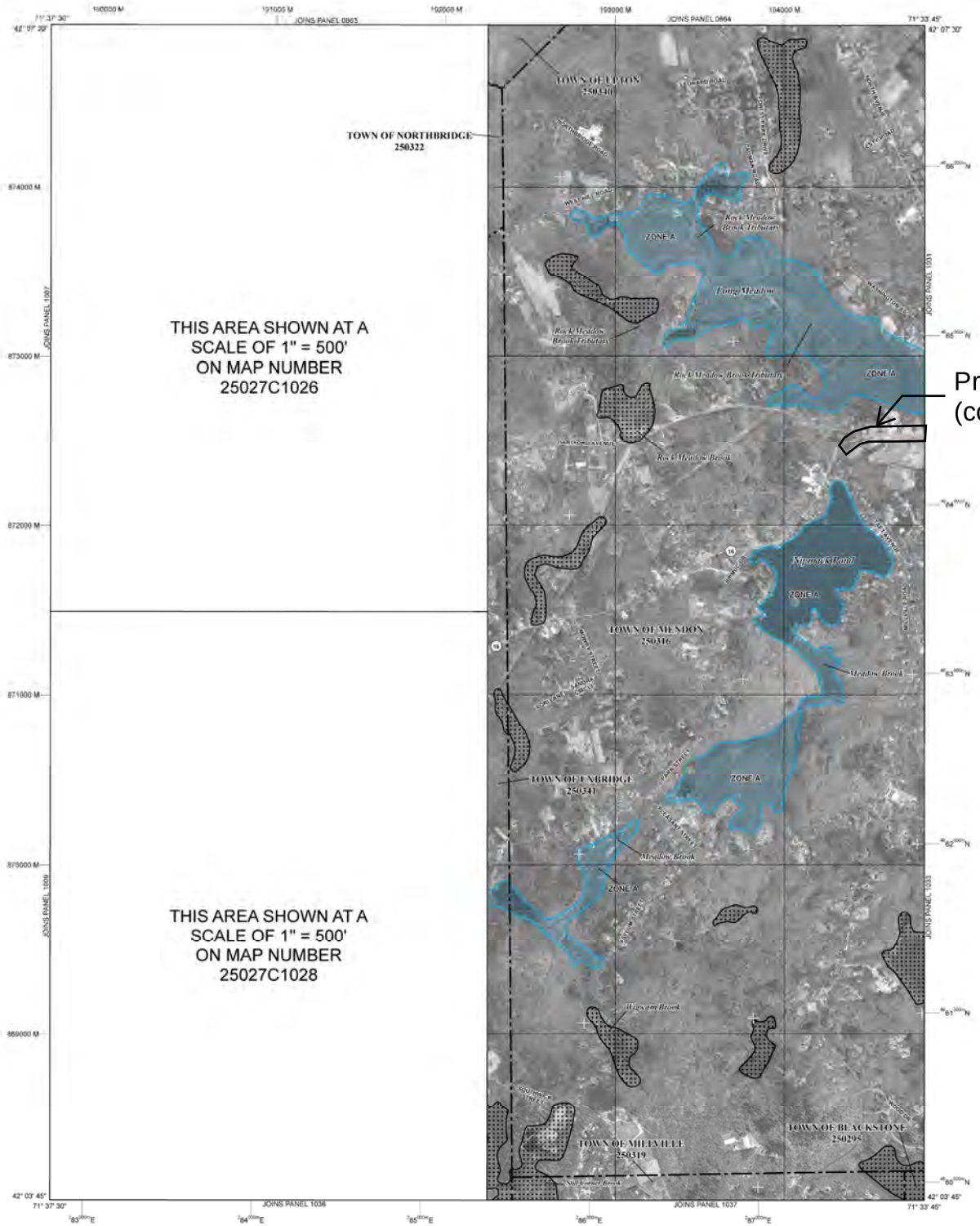
e limits shown on this map are based on the best data available at the time tion. Some changes due to annexations or de-annexations may have after this map was published, map users should contact appropriate y officials for the current corporate limit locations.

fer to the separately printed **Map Index** for an overview map of the owing the layout of map panels; community map repository addresses; sting of Communities table containing National Flood Insurance Program each community as well as a listing of the panels on which each community

nation on available products associated with this FIRM visit the **Map Center** (MSC) website at http://msc.fema.gov. Available products may reviously issued Letters of Map Change, a Flood Insurance Study Report, igital versions of this map. Many of these products can be ordered or directly from the MSC website.

ve **questions about this map**, how to order products, or the National urance Program in general, please call the **FEMA Map Information e (FMIX) 1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA http://www.fema.gov/business/nfip.

Proposal No. 60841-134688



Project Locus
(cont'd next page)

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, A1-A30, AH, AR, AR/A, V, and VE. The Base Flood Elevation is the water-s elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood El determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); av depths determined. For areas of alluvial fan flooding, velocities also d

ZONE AR — Special Flood Hazard Areas formerly protected from the 1% annual ch flood by a flood control system that was subsequently decertified. Zo AR indicates that the former flood control system is being restored to protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations deter

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood El determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be e encroachment so that the 1% annual chance flood can be carried without substantial inc flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood wi average depths of less than 1 foot or with drainage areas less than 1 squ mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Are

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and bo dividing Special Flood Hazard Areas of different Base Flood flood depths, or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; ele feet*

*Referenced to the North American Vertical Datum of 1988

Cross section line

Transect line

Culvert

Bridge

Geographic coordinates referenced to the North (1983 (NAD 83) Western Hemisphere

1000-meter Universal Transverse Mercator grid

Bench mark (see explanation in Notes to Users panel)

River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
July 4, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Commun Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance a or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1030E

FIRM

FLOOD INSURANCE RATE M

WORCESTER COUNT
MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 1030 OF 1075
(SEE MAP INDEX FOR FIRM PANEL LA

CONTAINS:

COMMUNITY	NUMBER	PANEL
BLACKSTONE, TOWN OF	250295	1030
MENDON, TOWN OF	250316	1030
MILLVILLE, TOWN OF	250319	1030
NORTHBRIDGE, TOWN OF	250322	1030
UPTON, TOWN OF	250340	1030
UXBRIDGE, TOWN OF	250341	1030

Notice to User: The **Map Number** sho should be used when placing map or **Community Number** shown above s used on insurance applications for the community.

MAP NU
25027C
EFFECTIVE
JULY 4

Federal Emergency Management

A00860 205

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography. These map files were provided in digital format by Massachusetts Geographic Information Systems (MassGIS). Ortho imagery was produced at a scale of 1:5,000 and photography is dated April 2005.

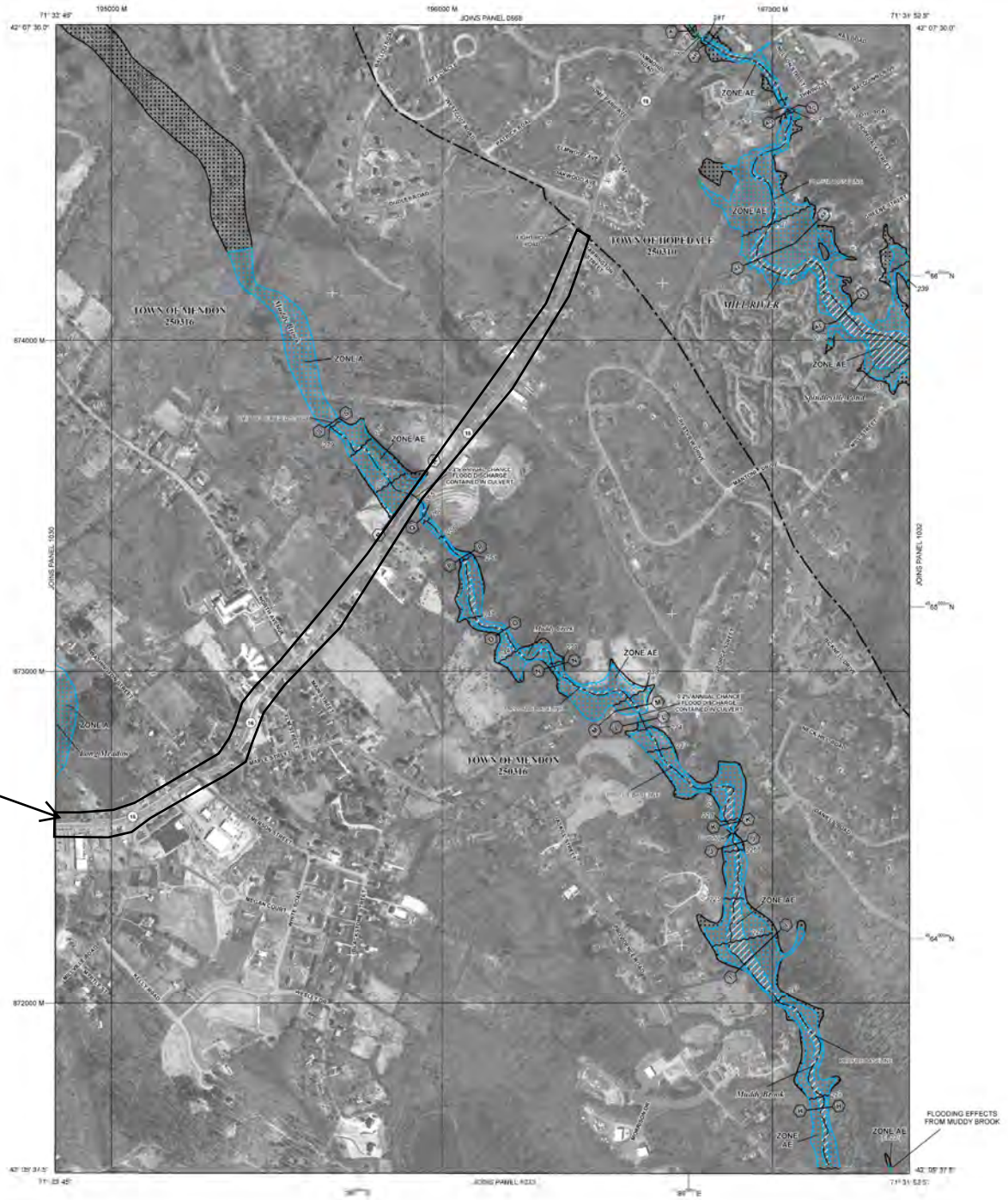
Flood profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, A1-A99, V, and V1-V30. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.
ZONE AE — Base Flood Elevations determined.
ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR — Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE V1-V30 — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Floodway Boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A — Cross section line
23 — 23 — Transect line
Culvert
Bridge
45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4685000 M — 1000-meter tick: Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection
1000-meter Universal Transverse Mercator grid values, zone 19N
CR3510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
Rivet Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
July 4, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1031E

FIRM
FLOOD INSURANCE RATE MAP
WORCESTER COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 1031 OF 1075
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOPEDALE, TOWN OF	250310	1031	E
MENDON, TOWN OF	250316	1031	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

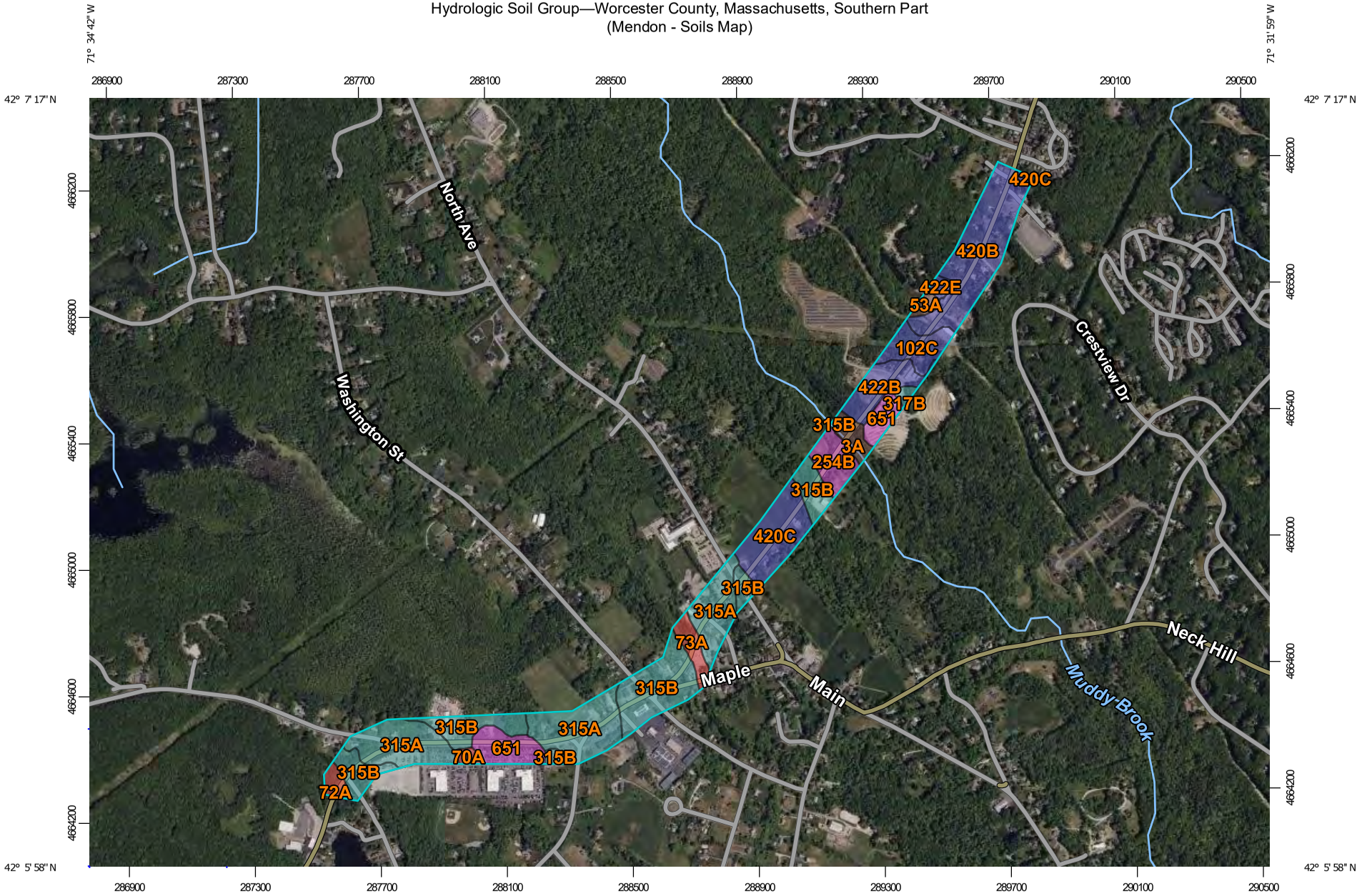
MAP NUMBER
25027C1031E
EFFECTIVE DATE
JULY 4, 2011

Federal Emergency Management Agency

Proposal No. 60849-1 311468

A00860 - 206

Hydrologic Soil Group—Worcester County, Massachusetts, Southern Part
(Mendon - Soils Map)



Proposal No. 608491-131468

A00860 - 207

Proposal No. 608491-131468

A00860 - 208

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 15, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3A	Scarboro and Walpole soils, 0 to 3 percent slopes	B/D	2.5	2.2%
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	1.1	1.0%
70A	Ridgebury fine sandy loam, 0 to 3 percent slopes	D	0.9	0.7%
72A	Whitman fine sandy loam, 0 to 3 percent slopes	D	1.5	1.3%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	2.8	2.4%
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	B	5.1	4.4%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	4.8	4.1%
315A	Scituate fine sandy loam, 0 to 3 percent slopes	C	27.8	24.0%
315B	Scituate fine sandy loam, 3 to 8 percent slopes	C	25.4	22.0%
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	C	0.7	0.6%
420B	Canton fine sandy loam, 3 to 8 percent slopes	B	18.3	15.8%
420C	Canton fine sandy loam, 8 to 15 percent slopes	B	10.1	8.7%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	6.0	5.2%
422E	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	B	0.8	0.7%
651	Udorthents, smoothed	A	8.0	6.9%
Totals for Area of Interest			**115.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix B

Catchment Area Plans
Catchment Area Calculations
Time of Concentration Calculations

Proposal No. 608491-131468

A00869 - 212

DRAINAGE AREA 601
AREA: ± 0.182 ac.

DRAINAGE AREA 358
AREA: ± 0.074 ac.

DRAINAGE AREA 603
AREA: ± 0.063 ac.

DRAINAGE AREA 605
AREA: ± 0.230 ac.

DRAINAGE AREA 103
AREA: ± 0.056 ac.

DRAINAGE AREA 344
AREA: ± 0.441 ac.

DRAINAGE AREA 380
AREA: ± 0.209 ac.

DRAINAGE AREA 379
AREA: ± 0.357 ac.

DRAINAGE AREA 351
AREA: ± 0.034 ac.

DRAINAGE AREA 665
AREA: ± 0.195 ac.

DRAINAGE AREA 607
AREA: ± 0.130 ac.

DRAINAGE AREA 101
AREA: ± 0.117 ac.

DRAINAGE AREA 106
AREA: ± 0.068 ac.

CBCI-358

EX CB-605

EX CB-603

EX CB-601

DI-379

EX CB-665

CBCI-344

CBCI-103

EX CB-607

DI-380

CBCI-351

CBCI-101

CBCI-105

TC PATH (TYP)

1949 SHLO 3683 BASELINE

1942 COUNTY BASELINE

HARTFORD AVENUE WEST

(VARIABLE WIDTH)

NAD 83

N

MILFORD STREET (ROUTE 16) DRAINAGE AREAS

DRAINAGE AREA 348
AREA ± 0.115 ac.

DRAINAGE AREA 292
AREA: ± 0.194 ac.

DRAINAGE AREA 114
AREA: ± 0.173 ac.

DRAINAGE AREA 294
AREA: ± 0.118 ac.

DRAINAGE AREA 117
AREA: ± 0.109 ac.

DRAINAGE AREA 297
AREA: ± 0.148 ac.

DRAINAGE AREA 120
AREA: ± 0.093 ac.

DRAINAGE AREA 320
AREA: ± 0.072 ac.

DRAINAGE AREA 123
AREA: ± 0.097 ac.

DRAINAGE AREA 128
AREA: ± 0.127 ac.

DRAINAGE AREA 111
AREA: ± 0.301 ac.

DRAINAGE AREA 115
AREA: ± 0.156 ac.

DRAINAGE AREA 295
AREA: ± 0.123 ac.

DRAINAGE AREA 118
AREA: ± 0.111 ac.

DRAINAGE AREA 121
AREA: ± 0.103 ac.

DRAINAGE AREA 124
AREA: 0.166 ± ac.

DRAINAGE AREA 129
AREA: ± 0.175 ac.

DRAINAGE AREA 298
AREA: ± 0.163 ac.

DRAINAGE AREA 319
AREA: ± 0.081 ac.

CBCI-348

CBCI-294

CBCI-114

CBCI-115

CBCI-117

CBCI-118

CBCI-297

CBCI-120

CBCI-320

CBCI-123

CBCI-128

DGCB-111

CBCI-292

CBCI-295

DGCB-298

DGCB-121

DGCB-319

DGCB-124

DGCB-129

CONTINUED ABOVE

CONTINUED ON SHEET NO. 2

1949 SHLO 3683 BASELINE

MILFORD STREET (ROUTE 16) DRAINAGE AREAS

MENDON DRAINAGE AREAS
SHEET 1 OF 5

0 40 100 200

SCALE: 1" = 40'

Proposal No. 608491-131468

A00860 - 213

N

NAD 83

DRAINAGE AREA 413
AREA: ± 1.005 ac.

DRAINAGE AREA 299
AREA: ± 0.177 ac.

CBCI-299

CBCI-147

DI-413

CONTINUED BELOW

DRAINAGE AREA 414
AREA: ± 0.951 ac.

CBCI-145

DRAINAGE AREA 145
AREA: ± 0.342 ac.

DRAINAGE AREA 139
AREA: ± 0.081 ac.

DRAINAGE AREA 147
AREA: ± 0.167 ac.

DRAINAGE AREA 148
AREA: ± 0.099 ac.

CBCI-139

DRAINAGE AREA 131
AREA: ± 0.320 ac.

DRAINAGE AREA 134
AREA: ± 0.397 ac.

DI-414

CBCI-143

CBCI-134

CBCI-131

CBCI-144

DRAINAGE AREA 144
AREA: ± 0.108 ac.

CBCI-141

CONTINUED ON SHEET NO. 1

DI-331

DRAINAGE AREA 143
AREA: ± 0.023 ac.

DRAINAGE AREA 331
AREA: ± 0.135 ac.

CBCI-132

DRAINAGE AREA 132
AREA: ± 0.055 ac.

DRAINAGE AREA 141
AREA: ± 0.061 ac.

EXTENT OF DEADFALL AREA TO BE REMOVED AS PART OF MITIGATION BENEFITS 329 SF (NOT F

5'WIDE CULVERT STONE SIDES W/CMP BOTTOM OF WATER EL=386.62'

CBCI-308

DRAINAGE AREA 308
AREA: ± 0.040 ac.

DRAINAGE AREA 173
AREA: ± 0.060 ac.

CBCI-173

DRAINAGE AREA 305
AREA: ± 0.121 ac.

CONTINUED ON SHEET NO. 3

MILFORD STREET (ROUTE 16) DRAINAGE AREAS

N

NAD 83

DRAINAGE AREA 350
AREA: ± 0.171 ac.

DRAINAGE AREA 614
AREA: ± 0.489 ac.

DRAINAGE AREA 615
AREA: ± 0.079 ac.

DRAINAGE AREA 163
AREA: ± 0.394 ac.

DRAINAGE AREA 169
AREA: ± 0.268 ac.

DRAINAGE AREA 350
AREA: ± 0.171 ac.

DRAINAGE AREA 154
AREA: ± 0.125 ac.

TC PATH (TYP)

EX CB-614

EX CB-615

CBCI-305

CBCI-169

DRAINAGE AREA 349
AREA: ± 0.496 ac.

DRAINAGE AREA 303
AREA: ± 0.065 ac.

DRAINAGE AREA 158
AREA: ± 0.200 ac.

DRAINAGE AREA 167
AREA: ± 0.502 ac.

GI-163

CB-154

CBCI-167

CBCI-349

CBCI-350

CBCI-153

CONTINUED ABOVE

CBCI-303

CBCI-150

CBCI-302

DRAINAGE AREA 618
AREA: ± 0.192 ac.

CBCI-170

EX CB-618

EX CB-617

CBCI-148

CBCI-151

CBCI-152

CBCI-159

DRAINAGE AREA 159
AREA: ± 0.057 ac.

DRAINAGE AREA 302
AREA: ± 0.063 ac.

DRAINAGE AREA 150
AREA: ± 0.113 ac.

DRAINAGE AREA 162
AREA: ± 0.098 ac.

CBCI-162

DRAINAGE AREA 151
AREA: ± 0.064 ac.

DRAINAGE AREA 152
AREA: ± 0.067 ac.

DRAINAGE AREA 170
AREA: ± 0.109 ac.

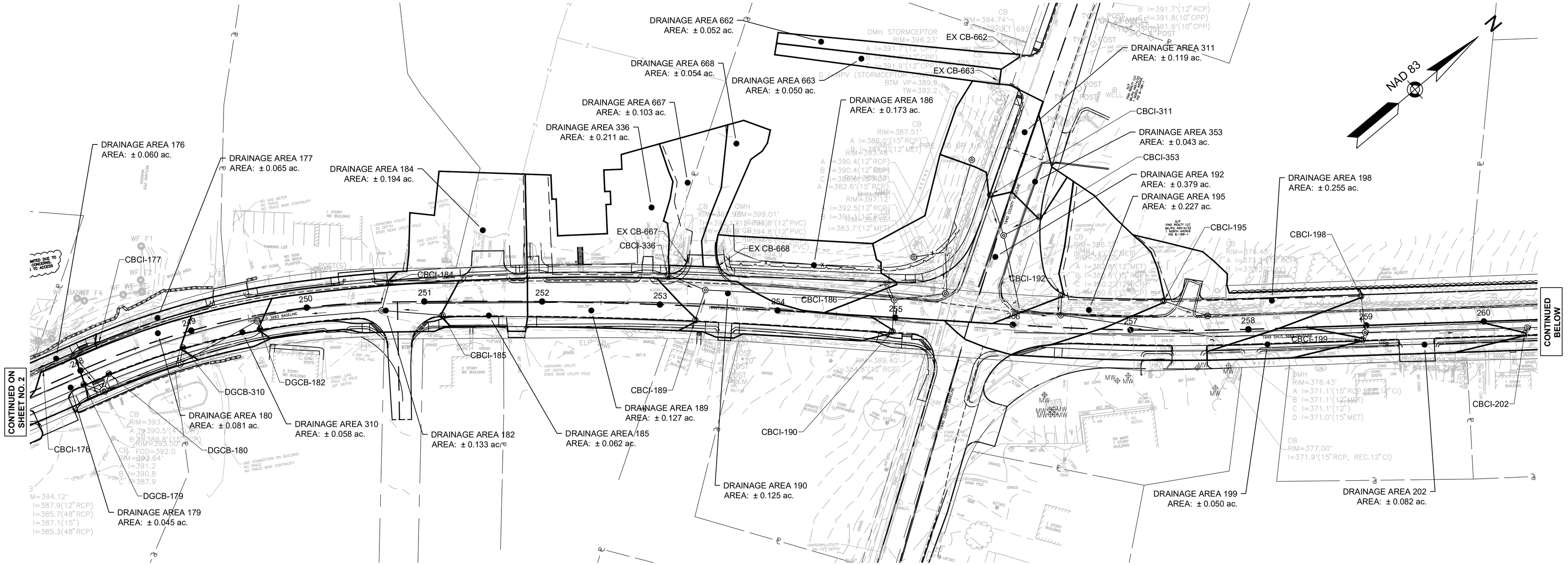
DRAINAGE AREA 617
AREA: ± 0.120 ac.

MILFORD STREET (ROUTE 16) DRAINAGE AREAS

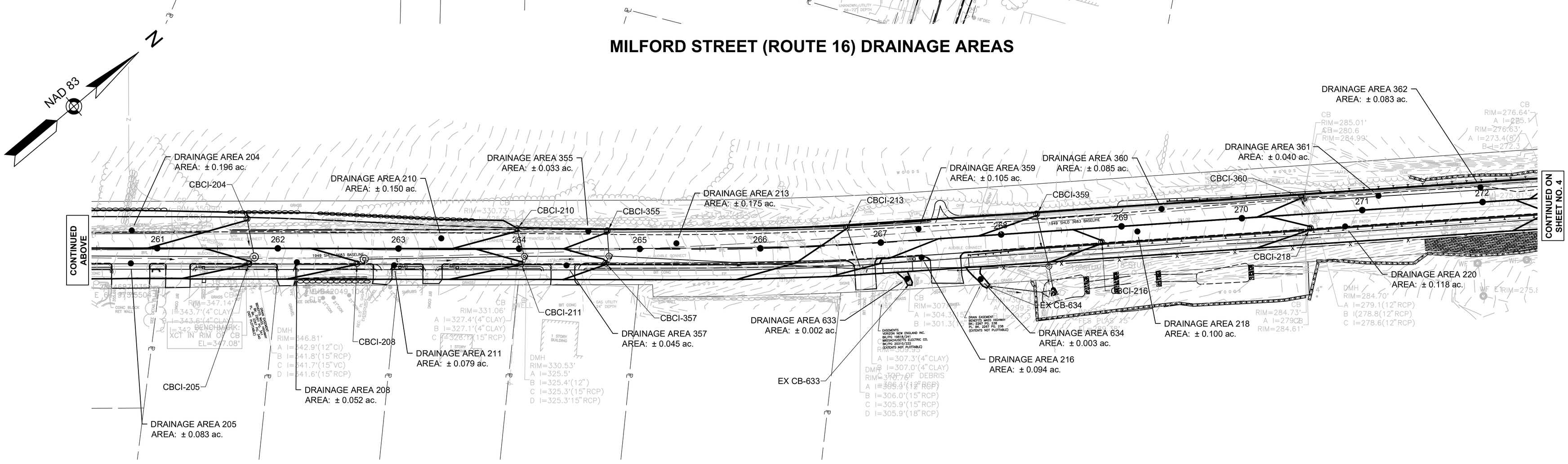
MENDON DRAINAGE AREAS
SHEET 2 OF 5

0 40 100 200

SCALE: 1" = 40'



MILFORD STREET (ROUTE 16) DRAINAGE AREAS



MILFORD STREET (ROUTE 16) DRAINAGE AREAS

MENDON DRAINAGE AREAS
SHEET 3 OF 5

0 40 100 200

SCALE: 1" = 40'

Proposal No. 608491-131468

A00869 - 214

Proposal No. 608491-131468

A00860 - 215

CONTINUED ON SHEET NO. 3

CONTINUED BELOW

CONTINUED ABOVE

CONTINUED ON SHEET NO. 5

NAD 83

N

CBCI-220

CBCI-221

CBCI-362

CBCI-364

CBCI-316

CBCI-224

CBCI-229

CBCI-230

CBCI-363

CBCI-377

DGCB-234

CBCI-236

CBCI-239

CBCI-366

CBCI-243

CBCI-246

CBCI-368

CBCI-369

CBCI-250

DRAINAGE AREA 221
AREA: ± 0.057 ac.

DRAINAGE AREA 316
AREA: ± 0.031 ac.

DRAINAGE AREA 224
AREA: ± 0.030 ac.

DRAINAGE AREA 229
AREA: ± 0.031 ac.

DRAINAGE AREA 230
AREA: ± 0.039 ac.

DRAINAGE AREA 234
AREA: ± 0.050 ac.

DRAINAGE AREA 236
AREA: ± 0.154 ac.

DRAINAGE AREA 239
AREA: ± 0.077 ac.

DRAINAGE AREA 243
AREA: ± 0.084 ac.

DRAINAGE AREA 246
AREA: ± 0.095 ac.

DRAINAGE AREA 250
AREA: ± 0.079 ac.

DRAINAGE AREA 363
AREA: ± 0.020 ac.

DRAINAGE AREA 364
AREA: ± 0.088 ac.

DRAINAGE AREA 366
AREA: ± 0.182 ac.

DRAINAGE AREA 368
AREA: ± 0.084 ac.

DRAINAGE AREA 369
AREA: ± 0.113 ac.

DRAINAGE AREA 377
AREA: ± 0.138 ac.

BENCHMARK: SPK IN UPL 26
EL=309.87'

BENCHMARK DPSQ CTR
EL=282.13'

1949 SHLO 3683 BASELINE

ACCESS EASEMENT TO SOLAR FACILITY BK/PG 55685/286

EASEMENT LINE

20' WIDE GRADING EASEMENT

MILFORD STREET (ROUTE 16) DRAINAGE AREAS

CBCI-256

CBCI-258

CBCI-259

CBCI-261

CBCI-264

CBCI-266

CBCI-268

DRAINAGE AREA 256
AREA: ± 0.096 ac.

DRAINAGE AREA 258
AREA: ± 0.065 ac.

DRAINAGE AREA 259
AREA: ± 0.097 ac.

DRAINAGE AREA 261
AREA: ± 0.099 ac.

DRAINAGE AREA 264
AREA: ± 0.103 ac.

DRAINAGE AREA 266
AREA: ± 0.149 ac.

DRAINAGE AREA 268
AREA: ± 0.066 ac.

DRAINAGE AREA 371
AREA: ± 0.069 ac.

BENCHMARK: XCT HYD
EL=351.73'

MASSACHUSETTS ELECTRIC COMPANY EASEMENT L.C. DOC No. 80464

NEW ENGLAND POWER COMPANY EASEMENT BK/PG 3429/29 OVERHEAD AND UNDERGROUND LINES LOCATION PER PLAN NO. 3429

TENNESSEE GAS PIPELINE COMPANY EASEMENT BK/PG 3447/439

APPROXIMATE LOCATION

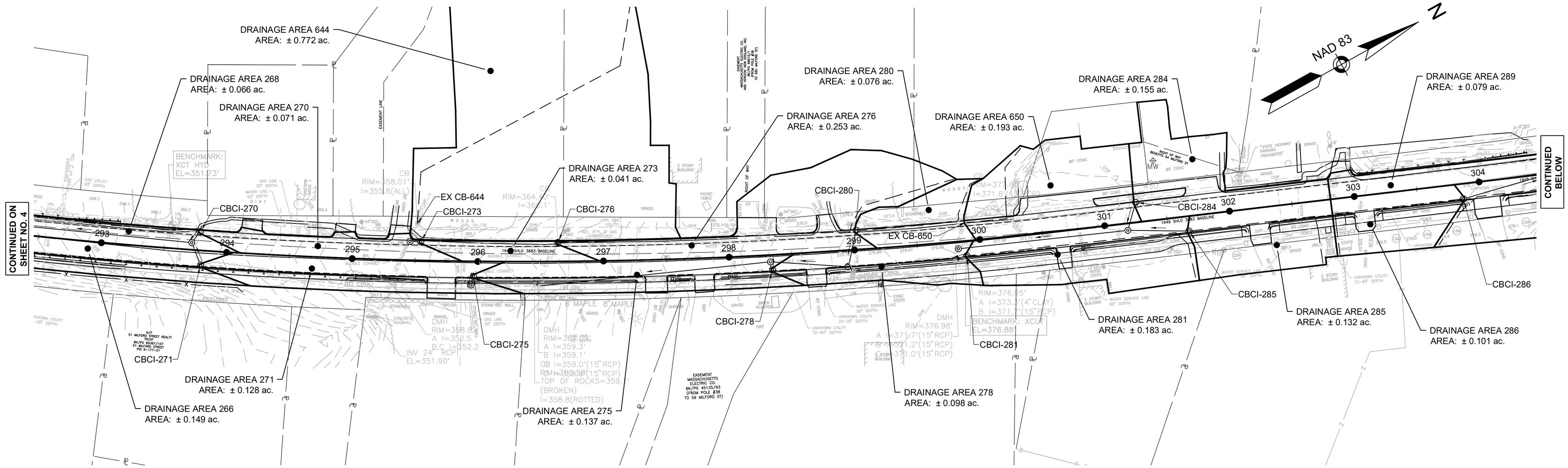
MILFORD STREET (ROUTE 16) DRAINAGE AREAS

MENDON DRAINAGE AREAS
SHEET 4 OF 5

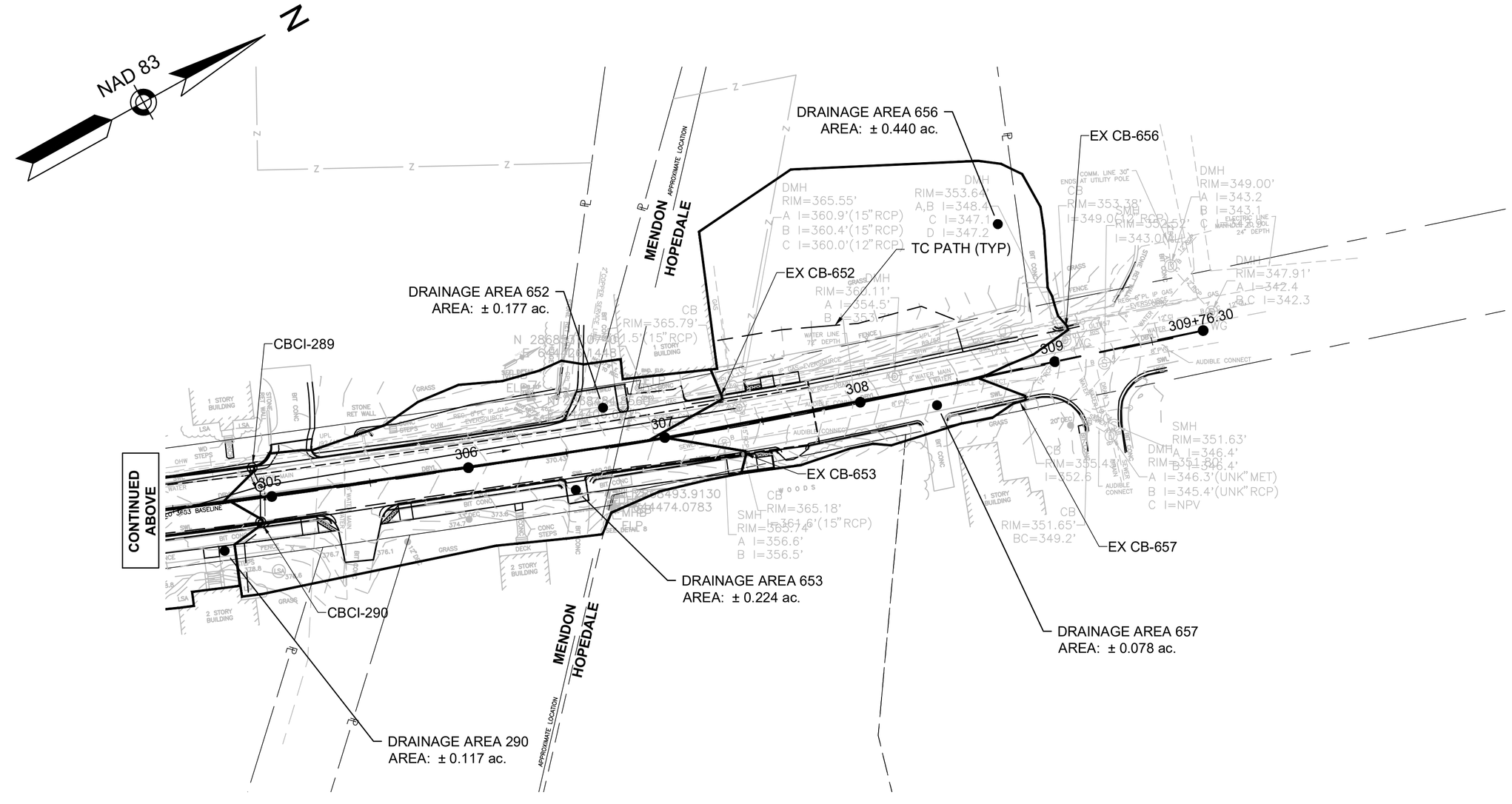
0 40 100 200

SCALE: 1" = 40'

Proposal No. 608491-131468



MILFORD STREET (ROUTE 16) DRAINAGE AREAS



MILFORD STREET (ROUTE 16) DRAINAGE AREAS

0 100 200

MENDON DRAINAGE AREAS
SHEET 5 OF 5

0 40 100 200
SCALE: 1" = 40'

A008601-216

Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Catchment Intensity (in/h)	Catchment Rational Flow (cfs)
CM-101	CBCI-101	0.117	0.84	0.083	7.19	0.71
CM-103	CBCI-103	0.056	0.83	0.153	5.43	0.25
CM-106	CBCI-106	0.068	0.83	0.083	7.19	0.41
CM-111	DGCB-111	0.301	0.71	0.083	7.19	1.54
CM-114	CBCI-114	0.173	0.90	0.083	7.19	1.13
CM-115	CBCI-115	0.156	0.49	0.083	7.19	0.55
CM-117	CBCI-117	0.109	0.90	0.083	7.19	0.71
CM-118	CBCI-118	0.111	0.58	0.083	7.19	0.47
CM-120	CBCI-120	0.093	0.90	0.083	7.19	0.60
CM-121	DGCB-121	0.103	0.55	0.083	7.19	0.41
CM-123	CBCI-123	0.097	0.90	0.083	7.19	0.63
CM-124	DGCB-124	0.166	0.76	0.083	7.19	0.92
CM-128	CBCI-128	0.127	0.90	0.083	7.19	0.83
CM-129	DGCB-129	0.175	0.47	0.083	7.19	0.59
CM-131	CBCI-131	0.320	0.95	0.083	7.19	2.20
CM-132	CBCI-132	0.055	0.53	0.083	7.19	0.21
CM-134	CBCI-134	0.397	0.85	0.083	7.19	2.45
CM-139	CBCI-139	0.081	0.88	0.083	7.19	0.52
CM-141	CBCI-141	0.061	0.76	0.083	7.19	0.34
CM-143	CBCI-143	0.023	0.76	0.083	7.19	0.13
CM-144	CBCI-144	0.108	0.68	0.083	7.19	0.53
CM-145	CBCI-145	0.342	0.74	0.083	7.19	1.83
CM-147	CBCI-147	0.167	0.84	0.153	5.43	0.77
CM-148	CBCI-148	0.099	0.76	0.083	7.19	0.55
CM-150	CBCI-150	0.113	0.87	0.083	7.19	0.71
CM-151	CBCI-151	0.064	0.74	0.083	7.19	0.34
CM-152	CBCI-152	0.067	0.82	0.083	7.19	0.40
CM-154	CB-154	0.125	0.90	0.083	7.19	0.82
CM-158	CBCI-158	0.200	0.58	0.105	6.63	0.78
CM-159	CBCI-159	0.057	0.70	0.182	4.90	0.20
CM-162	CBCI-162	0.098	0.75	0.083	7.19	0.53
CM-163	GI-163	0.394	0.66	0.148	5.56	1.47
CM-167	CBCI-167	0.502	0.58	0.273	3.88	1.13
CM-169	CBCI-169	0.268	0.64	0.128	6.06	1.04
CM-170	CBCI-170	0.109	0.72	0.083	7.19	0.57
CM-173	CBCI-173	0.060	0.88	0.083	7.19	0.38
CM-176	CBCI-176	0.060	0.87	0.083	7.19	0.38
CM-177	CBCI-177	0.065	0.90	0.083	7.19	0.43
CM-179	DGCB-179	0.045	0.88	0.083	7.19	0.29
CM-180	DGCB-180	0.081	0.83	0.083	7.19	0.49
CM-182	DGCB-182	0.133	0.89	0.083	7.19	0.86
CM-184	CBCI-184	0.194	0.46	0.208	4.55	0.41
CM-185	CBCI-185	0.062	0.90	0.083	7.19	0.41
CM-186	CBCI-186	0.173	0.56	0.083	7.19	0.71
CM-189	CBCI-189	0.127	0.90	0.083	7.19	0.83
CM-190	CBCI-190	0.125	0.89	0.083	7.19	0.81
CM-192	CBCI-192	0.379	0.61	0.083	7.19	1.67
CM-195	CBCI-195	0.227	0.48	0.204	4.60	0.51
CM-198	CBCI-198	0.255	0.78	0.102	6.72	1.34
CM-199	CBCI-199	0.050	0.75	0.083	7.19	0.27
CM-202	CBCI-202	0.082	0.80	0.083	7.19	0.47
CM-204	CBCI-204	0.196	0.79	0.083	7.19	1.11
CM-205	CBCI-205	0.083	0.87	0.083	7.19	0.53
CM-208	CBCI-208	0.052	0.81	0.083	7.19	0.30
CM-210	CBCI-210	0.150	0.77	0.083	7.19	0.83
CM-211	CBCI-211	0.079	0.82	0.083	7.19	0.47
CM-213	CBCI-213	0.175	0.85	0.083	7.19	1.07
CM-216	CBCI-216	0.094	0.80	0.083	7.19	0.54
CM-218	CBCI-218	0.100	0.78	0.083	7.19	0.57
CM-220	CBCI-220	0.118	0.78	0.083	7.19	0.67
CM-221	CBCI-221	0.057	0.79	0.083	7.19	0.32
CM-224	CBCI-224	0.030	0.78	0.083	7.19	0.17
CM-229	CBCI-229	0.031	0.79	0.083	7.19	0.18
CM-230	CBCI-230	0.039	0.79	0.083	7.19	0.22
CM-234	DGCB-234	0.050	0.78	0.083	7.19	0.28
CM-236	CBCI-236	0.154	0.79	0.083	7.19	0.88
CM-239	CBCI-239	0.077	0.85	0.083	7.19	0.47
CM-243	CBCI-243	0.084	0.82	0.083	7.19	0.50
CM-246	CBCI-246	0.095	0.83	0.083	7.19	0.57
CM-250	CBCI-250	0.079	0.67	0.083	7.19	0.38
CM-256	CBCI-256	0.096	0.77	0.083	7.19	0.54
CM-258	CBCI-258	0.065	0.90	0.083	7.19	0.42
CM-259	CBCI-259	0.097	0.80	0.083	7.19	0.56
CM-261	CBCI-261	0.099	0.90	0.083	7.19	0.65
CM-264	CBCI-264	0.103	0.81	0.083	7.19	0.60
CM-266	CBCI-266	0.149	0.78	0.083	7.19	0.84
CM-268	CBCI-268	0.066	0.90	0.083	7.19	0.43
CM-270	CBCI-270	0.071	0.90	0.083	7.19	0.47
CM-271	CBCI-271	0.128	0.79	0.083	7.19	0.73
CM-273	CBCI-273	0.041	0.90	0.083	7.19	0.27
CM-275	CBCI-275	0.137	0.80	0.083	7.19	0.79
CM-276	CBCI-276	0.253	0.58	0.179	4.94	0.74
CM-278	CBCI-278	0.098	0.72	0.083	7.19	0.51
CM-280	CBCI-280	0.076	0.47	0.121	6.23	0.22
CM-281	CBCI-281	0.183	0.53	0.11	6.51	0.63

Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Catchment Intensity (in/h)	Catchment Rational Flow (cfs)
CM-284	CBCI-284	0.155	0.88	0.083	7.19	0.99
CM-285	CBCI-285	0.132	0.53	0.092	6.97	0.49
CM-286	CBCI-286	0.101	0.58	0.086	7.12	0.42
CM-289	CBCI-289	0.079	0.90	0.083	7.19	0.52
CM-290	CBCI-290	0.117	0.58	0.184	4.86	0.33
CM-292	CBCI-292	0.194	0.73	0.083	7.19	1.02
CM-294	CBCI-294	0.118	0.90	0.083	7.19	0.77
CM-295	CBCI-295	0.123	0.52	0.083	7.19	0.46
CM-297	CBCI-297	0.148	0.90	0.083	7.19	0.96
CM-298	DGCB-298	0.163	0.61	0.083	7.19	0.72
CM-299	CBCI-299	0.177	0.78	0.083	7.19	1.00
CM-302	CBCI-302	0.063	0.78	0.083	7.19	0.36
CM-303	CBCI-303	0.065	0.75	0.083	7.19	0.35
CM-305	CBCI-305	0.121	0.81	0.083	7.19	0.70
CM-308	CBCI-308	0.040	0.86	0.083	7.19	0.25
CM-310	DGCB-310	0.058	0.82	0.083	7.19	0.35
CM-311	CBCI-311	0.119	0.45	0.083	7.19	0.39
CM-316	CBCI-316	0.031	0.79	0.083	7.19	0.17
CM-319	DGCB-319	0.081	0.83	0.083	7.19	0.49
CM-320	CBCI-320	0.072	0.90	0.083	7.19	0.47
CM-331	DI-331	0.135	0.15	0.136	5.86	0.12
CM-336	CBCI-336	0.211	0.46	0.268	3.90	0.38
CM-344	CBCI-344	0.441	0.29	0.156	5.36	0.69
CM-348	CBCI-348	0.115	0.90	0.083	7.19	0.75
CM-349	CBCI-349	0.161	0.50	0.155	5.40	0.43
CM-350	CBCI-350	0.171	0.72	0.085	7.14	0.89
CM-351	CBCI-351	0.034	0.90	0.083	7.19	0.22
CM-353	CBCI-353	0.043	0.76	0.083	7.19	0.23
CM-355	CBCI-355	0.033	0.90	0.083	7.19	0.21
CM-357	CBCI-357	0.045	0.80	0.083	7.19	0.26
CM-358	CBCI-358	0.074	0.64	0.083	7.19	0.34
CM-359	CBCI-359	0.105	0.86	0.083	7.19	0.66
CM-360	CBCI-360	0.085	0.90	0.083	7.19	0.56
CM-362	CBCI-362	0.083	0.90	0.083	7.19	0.54
CM-363	CBCI-363	0.020	0.90	0.083	7.19	0.13
CM-364	CBCI-364	0.088	0.90	0.083	7.19	0.57
CM-366	CBCI-366	0.182	0.77	0.083	7.19	1.01
CM-368	CBCI-368	0.084	0.90	0.083	7.19	0.55
CM-369	CBCI-369	0.113	0.90	0.083	7.19	0.73
CM-371	CBCI-371	0.069	0.89	0.083	7.19	0.45
CM-377	CBCI-377	0.138	0.89	0.083	7.19	0.89
CM-379	DI-379	0.357	0.15	0.233	4.21	0.23
CM-380	DI-380	0.209	0.15	0.129	6.05	0.19
CM-413	DI-413	1.005	0.74	0.083	7.19	5.41
CM-414	DI-414	0.951	0.30	0.083	7.19	2.09
CM-601	EX CB-601	0.182	0.90	0.083	7.19	1.19
CM-603	EX CB-603	0.063	0.90	0.083	7.19	0.41
CM-605	EX CB-605	0.230	0.89	0.235	4.19	0.86
CM-607	EX CB-607	0.130	0.84	0.083	7.19	0.79
CM-614	EX CB-614	0.489	0.42	0.273	3.87	0.80
CM-615	EX CB-615	0.079	0.58	0.083	7.19	0.33
CM-617	EX CB-617	0.120	0.64	0.083	7.19	0.56
CM-618	EX CB-618	0.192	0.60	0.124	6.17	0.71
CM-633	EX CB-633	0.002	0.15	0.083	7.19	0.00
CM-634	EX CB-634	0.003	0.15	0.083	7.19	0.00
CM-644	EX CB-644	0.772	0.15	0.123	6.20	0.72
CM-650	EX CB-650	0.193	0.70	0.116	6.37	0.87
CM-652	EX CB-652	0.177	0.65	0.083	7.19	0.84
CM-653	EX CB-653	0.224	0.60	0.085	7.14	0.96
CM-656	EX CB-656	0.440	0.37	0.144	5.66	0.91
CM-657	EX CB-657	0.078	0.77	0.083	7.19	0.43
CM-662	EX CB-662	0.052	0.90	0.083	7.19	0.34
CM-663	EX CB-663	0.050	0.90	0.083	7.19	0.33
CM-665	EX CB-665	0.195	0.20	0.234	4.20	0.16
CM-667	EX CB-667	0.103	0.38	0.173	5.01	0.20
CM-668	EX CB-668	0.054	0.90	0.083	7.19	0.35

	TR-55 Sheet Flow					TR-55 Shallow Concentrated Flow				TR-55 Shallow Concentrated Flow				TR-55 Channel Flow					
	Manning's n = 0.80 for woods or 0.40 for grass					Grassed Waterway				Paved				Manning's n = 0.40 for grass or 0.01 for pavement					
	2 Year 24 Hr Depth = 3.37 in													Flow area = 1.5 sf					
														Wetted perimeter = 4 ft					
	top elev	bottom elev	Length	Manning's n	Slope (ft/ft)	Length	top elev	bottom elev	Slope (ft/ft)	Length	top elev	bottom elev	Slope (ft/ft)	Manning's n	Length	top elev	bottom elev	Slope (ft/ft)	Time of Conc. (hrs)
CM-147	441.1	439.5	43	0.4	0.04					14	439.5	438.6	0.06	0.01	21	438.6	438.1	0.02	0.153
CM-158	436.4	430.6	50	0.4	0.12	38	430.6	427.0	0.09	64	427.0	425.2	0.03	0.01	29	425.2	422.9	0.08	0.105
CM-163	421.9	419.5	50	0.4	0.05	62	419.5	418.0	0.02	11	418.0	417.6	0.04	0.01	77	417.6	412.1	0.07	0.148
CM-167	419.3	418.8	50	0.4	0.01	70	418.8	413.9	0.07	30	413.9	411.7	0.07	0.01	157	411.7	402.8	0.06	0.273
CM-169	405.5	403.2	44	0.4	0.05					30	403.2	401.2	0.07	0.01	94	401.2	397.3	0.04	0.128
CM-184	400.9	400.0	50	0.4	0.02	26	400.0	399.4	0.02	8	399.4	398.9	0.06	0.01	114	398.9	397.7	0.01	0.208
CM-195	390.2	389.1	50	0.4	0.02					47	389.1	385.6	0.07	0.01	80	385.6	378.9	0.08	0.204
CM-198	386.8	381.2	50	0.4	0.11	13	381.2	378.5	0.21					0.01	160	378.5	367.0	0.07	0.102
CM-276	382.8	377.0	50	0.8	0.12	49	377.0	375.2	0.04					0.01	232	375.2	365.1	0.04	0.179
CM-280	383.0	376.9	37	0.8	0.16									0.01	80	376.9	375.3	0.02	0.121
CM-281	379.7	378.8	27	0.4	0.03					13	378.8	378.3	0.04	0.01	166	378.3	377.1	0.01	0.11
CM-285	380.5	379.0	28	0.4	0.05					10	379.0	378.9	0.01	0.01	100	378.9	378.3	0.01	0.092
CM-286	380.2	379.3	23	0.4	0.04					10	379.3	378.9	0.04	0.01	101	378.9	378.2	0.01	0.086
CM-290	379.0	378.7	31	0.4	0.01					18	378.7	378.1	0.03	0.01	95	378.1	376.0	0.02	0.184
CM-331	443.7	442.7	34	0.4	0.03	118	442.7	439.5	0.03										0.136
CM-336	402.4	401.9	50	0.4	0.01	24	401.9	399.4	0.10	8	399.4	398.9	0.06	0.01	97	398.9	397.7	0.01	0.268
CM-344	439.0	425.3	50	0.8	0.27	196	425.3	423.1	0.01										0.156
CM-349	440.2	438.8	43	0.4	0.03					15	438.8	437.9	0.06	0.01	137	437.9	435.1	0.02	0.155
CM-350	436.9	435.6	25	0.4	0.05					39	435.6	433.9	0.04	0.01	146	433.9	429.2	0.03	0.085
CM-653	376.9	376.7	25	0.4	0.01					20	376.7	375.8	0.04	0.01	237	375.8	365.3	0.04	0.085
CM-614	432.1	431.4	50	0.4	0.01	48	431.4	429.2	0.05					0.01	148	429.2	427.1	0.01	0.273
CM-618	409.3	406.0	50	0.4	0.07					9	406.0	404.7	0.14	0.01	160	404.7	394.1	0.07	0.124
CM-650	383.0	379.2	50	0.4	0.08	11	379.2	377.9	0.12					0.01	32	377.9	377.1	0.02	0.116
CM-656	368.1	365.8	50	0.4	0.05	89	365.8	357.3	0.10					0.01	52	357.3	353.6	0.07	0.144
CM-665	440.6	437.5	50	0.8	0.06	162	437.5	423.1	0.09										0.234
CM-667	401.9	400.6	50	0.4	0.03	32	400.6	399.4	0.04					0.01	27	399.4	397.9	0.06	0.173
CM-379	441.9	438.7	50	0.8	0.06	124	438.7	433	0.05										0.233
CM-380	444.5	441.7	50	0.4	0.06														0.129
CM-644	370.0	364.3	50	0.4	0.11	221	364.3	358	0.03										0.123

Appendix C

Catch Basin Spread Analysis

HNTB	The HNTB Companies	MADE BY: DCS	DATE: 1/10/2023	JOB NO. 608491	
		CHECKED BY WJS	DATE:	PAGE NO.	
FOR	MENDON - ROUTE 16	BACKCHECKED BY	DATE:		

Catch Basin Spread Analysis - 10-Year Storm

Label	Station	Offset (ft)	Elevation (Rim) (ft)	Inlet Location	Inlet Drainage Area (acres)	Inlet C	Local Rational Flow(cfs)	Carryover Rational Flow (cfs)	Total Rational Flow to Inlet (cfs)	Longitudinal Slope (Inlet) (ft/ft)	Road Cross Slope (ft/ft)	Grate Length (ft)	Depth (Gutter) (in)	Capture Efficiency (Calculated) (%)	Bypassed Rational Flow (cfs)	Bypass Target	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Spread (ft)	Allowable Spread (ft)	Spread Check	Spread Difference (ft)
CB-381	206+05.09	-34.74	421.51	In Sag	0.00	(N/A)	#N/A	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	<None>	418.84	418.84	0.00	6.0	Pass	6.0
CBCI-101	211+19.00	11.50	443.30	On Grade	0.12	0.84	#N/A	0.71	0.71	0.02	0.06	2.00	1.80	98.60	0.01	EX CB-607	439.50	439.50	2.50	6.0	Pass	3.5
CBCI-103	209+51.19	11.49	438.09	On Grade	0.06	0.83	#N/A	0.25	0.26	0.04	0.06	2.00	1.10	100.00	0.00	EX CB-605	434.23	434.23	1.60	6.0	Pass	4.4
CBCI-106	212+31.97	11.29	444.97	On Grade	0.07	0.83	#N/A	0.41	0.41	0.01	0.06	2.00	1.80	99.10	0.00	CB-101	440.71	440.71	2.50	6.0	Pass	3.5
CBCI-114	217+95.44	-29.51	437.71	On Grade	0.17	0.90	#N/A	1.33	1.22	0.02	0.03	2.00	1.80	77.10	0.28	CB-294	433.91	433.91	5.00	8.0	Pass	3.0
CBCI-115	218+00.68	12.09	437.99	On Grade	0.16	0.90	#N/A	0.49	0.50	0.02	0.02	2.00	1.40	99.90	0.29	CB-295	433.84	433.84	3.50	6.0	Pass	0.1
CBCI-117	220+58.44	-29.50	433.23	On Grade	0.11	0.90	#N/A	0.71	0.93	0.02	0.03	2.00	1.60	81.20	0.17	CB-297	429.82	429.82	4.60	8.0	Pass	3.4
CBCI-118	220+57.90	12.09	433.62	On Grade	0.11	0.58	#N/A	0.47	0.66	0.02	0.02	2.00	1.20	75.90	0.16	CB-298	429.39	429.39	5.20	6.0	Pass	0.8
CBCI-120	223+43.03	-29.50	428.89	On Grade	0.09	0.90	#N/A	0.60	0.85	0.01	0.03	4.00	1.90	88.30	0.10	CB-320	426.61	426.61	5.40	8.0	Pass	2.6
CBCI-123	224+18.21	-28.91	428.78	On Grade	0.10	0.90	#N/A	0.63	1.16	0.00	0.03	2.00	2.30	71.90	0.33	CB-320	426.55	426.55	6.50	8.0	Pass	1.5
CBCI-128	225+20.02	-28.91	429.77	On Grade	0.10	0.90	#N/A	0.83	1.77	0.02	0.03	2.00	2.10	70.30	0.53	CB-123	426.58	426.58	5.90	8.0	Pass	2.1
CBCI-131	226+64.50	-29.50	433.41	On Grade	0.32	0.95	#N/A	2.20	2.85	0.03	0.03	2.00	2.20	67.00	0.94	CB-128	429.49	429.49	6.10	8.0	Pass	1.9
CBCI-132	226+63.27	11.50	433.90	On Grade	0.06	0.53	#N/A	0.21	0.21	0.04	0.01	2.00	0.50	77.90	0.05	CB-129	429.68	429.68	4.80	6.0	Pass	1.2
CBCI-134	229+89.59	-29.49	440.23	On Grade	0.40	0.85	#N/A	2.45	2.58	0.03	0.04	2.00	2.30	75.20	0.64	CB-131	437.21	437.21	5.10	8.0	Pass	2.9
CBCI-139	231+43.01	-29.49	445.12	On Grade	0.08	0.88	#N/A	0.52	0.52	0.01	0.02	2.00	1.80	90.00	0.05	CB-134	441.01	441.23	3.80	8.0	Pass	4.2
CBCI-141	400+54.10	26.60	447.49	On Grade	0.06	0.76	#N/A	0.34	0.34	0.02	0.01	2.00	0.80	76.10	0.08	CB-134	443.41	443.41	5.10	9.7	Pass	4.6
CBCI-143	400+32.53	-15.99	447.60	On Grade	0.02	0.76	#N/A	0.13	0.13	0.03	0.02	2.00	0.60	96.70	0.00	CB-139	443.49	443.49	2.80	8.8	Pass	6.0
CBCI-144	400+47.78	-44.54	447.42	On Grade	0.11	0.68	#N/A	0.53	0.53	0.01	0.01	2.00	1.10	57.50	0.23	CB-145	443.38	443.38	8.90	16.8	Pass	7.9
CBCI-145	213+98.59	-29.51	443.36	On Grade	0.34	0.74	#N/A	1.83	2.06	0.02	0.03	2.00	2.30	75.60	0.50	CB-299	439.83	439.83	5.10	11.3	Pass	6.2
CBCI-147	236+23.73	-28.99	438.08	On Grade	0.17	0.84	#N/A	0.77	1.02	0.02	0.03	2.00	1.70	80.30	0.20	CB-349	434.49	434.49	4.60	10.5	Pass	5.9
CBCI-148	236+64.00	11.51	437.33	On Grade	0.10	0.76	#N/A	0.55	0.55	0.03	0.01	2.00	0.90	73.20	0.15	CB-150	433.72	433.72	5.40	6.0	Pass	0.6
CBCI-150	237+62.59	11.51	434.60	On Grade	0.11	0.87	#N/A	0.71	0.86	0.03	0.02	2.00	1.30	74.50	0.22	CB-302	430.81	430.81	5.20	6.0	Pass	0.8
CBCI-151	238+57.79	11.51	432.01	On Grade	0.06	0.74	#N/A	0.34	0.45	0.03	0.02	2.00	1.00	85.00	0.07	CB-303	428.21	428.21	4.10	6.0	Pass	1.9
CBCI-152	239+56.99	11.51	428.79	On Grade	0.07	0.82	#N/A	0.40	0.45	0.04	0.02	2.00	0.90	87.20	0.06	CB-159	424.06	424.06	3.80	6.0	Pass	2.2
CBCI-158	240+75.63	-25.47	422.93	On Grade	0.20	0.58	#N/A	1.12	0.96	0.06	0.03	2.00	1.40	85.90	0.16	GI-163	419.82	419.82	3.90	8.0	Pass	4.1
CBCI-159	600+39.40	-0.53	425.00	On Grade	0.06	0.70	#N/A	0.20	0.23	0.01	0.04	2.00	1.10	98.50	0.00	OUTFALL G-22	420.20	420.20	2.60	6.0	Pass	3.4
CBCI-167	244+44.21	-21.65	402.83	On Grade	0.04	0.76	#N/A	1.11	1.34	0.05	0.03	2.00	1.60	84.70	0.21	CB-169	399.37	399.37	4.00	8.0	Pass	4.0
CBCI-169	245+75.20	-18.74	397.31	On Grade	0.04	0.64	#N/A	1.04	1.36	0.03	0.03	2.00	1.70	79.90	0.27	CB-305	395.14	395.14	4.60	7.5	Pass	2.9
CBCI-170	701+39.39	-14.65	405.98	On Grade	0.11	0.72	#N/A	0.57	0.57	0.08	0.01	2.00	0.70	76.50	0.13	EX CB-618	401.77	401.77	4.90	10.0	Pass	5.1
CBCI-173	246+89.63	-15.92	394.66	On Grade	0.06	0.88	#N/A	0.68	0.68	0.02	0.02	2.00	1.30	75.30	0.17	CB-308	392.31	392.31	5.30	8.0	Pass	2.7
CBCI-176	247+71.45	-14.42	394.18	In Sag	0.06	0.87	#N/A	0.00	0.55	0.00	0.03	2.00	1.80	100.00	0.00	<None>	390.52	390.52	5.10	8.0	Pass	2.9
CBCI-177	248+22.40	-14.44	394.43	On Grade	0.07	0.90	#N/A	0.43	0.47	0.01	0.03	2.00	1.50	87.40	0.06	CB-176	390.50	390.50	4.10	10.3	Pass	6.2
CBCI-184	250+70.60	-16.61	397.69	On Grade	0.19	0.46	#N/A	0.41	0.41	0.02	0.03	2.00	1.30	92.70	0.03	CB-177	393.65	393.65	3.40	8.0	Pass	4.6
CBCI-185	251+15.26	11.97	397.86	On Grade	0.06	0.90	#N/A	0.41	0.41	0.01	0.02	2.00	1.10	82.30	0.07	CB-182	393.84	393.84	4.50	6.0	Pass	1.5
CBCI-186	254+01.25	-28.63	390.72	On Grade	0.17	0.56	#N/A	0.71	0.75	0.02	0.03	2.00	1.50	86.00	0.10	CB-195	386.25	386.25	4.00	11.3	Pass	7.3
CBCI-189	253+30.57	12.06	396.59	On Grade	0.13	0.90	#N/A	0.83	0.83	0.03	0.02	2.00	1.30	74.60	0.21	CB-190	392.63	392.63	5.20	6.0	Pass	0.8
CBCI-190	254+98.35	11.98	390.15	On Grade	0.13	0.89	#N/A	0.81	1.02	0.03	0.02	2.00	1.40	71.20	0.29	OUTFALL G-23	386.21	386.21	5.70	6.0	Pass	0.3
CBCI-192	256+40.14	-27.61	384.22	On Grade	0.38	1.67	#N/A	1.69	0.06	0.03	2.00	1.60	80.40	0.33	CB-195	380.49	380.49	4.50	8.7	Pass	4.2
CBCI-195	257+27.87	-24.98	379.13	On Grade	0.23	0.48	#N/A	0.51	0.78	0.06	0.03	2.00	1.20	91.70	0.06	CB-198	375.00	375.00	3.30	8.0	Pass	4.7
CBCI-198	258+96.49	-25.00	367.25	On Grade	0.26	0.78	#N/A	1.34	1.43	0.07	0.03	2.00	1.50	84.00	0.23	CB-204	363.16	363.16	4.10	8.0	Pass	3.9
CBCI-199	258+96.49	12.00	367.54	On Grade	0.05	0.75	#N/A	0.27	0.27	0.07	0.02	2.00	0.70	96.50	0.01	CB-202	363.21	363.21	2.80	6.0	Pass	3.2
CBCI-202	260+34.38	11.41	357.58	On Grade	0.08	0.80	#N/A	0.47	0.48	0.07	0.02	2.00	0.80	90.10	0.05	CB-205	353.28	353.28	3.50	6.0	Pass	2.5
CBCI-204	261+74.44	-24.52	347.15	On Grade	0.20	0.79	#N/A	1.11	1.36	0.07	0.03	2.00	1.20	86.70	0.19	CB-210	343.15	343.15	3.90	8.0	Pass	4.1
CBCI-205	261+76.25	12.60	347.29	On Grade	0.08	0.87	#N/A	0.57	0.57	0.07	0.02	2.00	0.80	87.70	0.07	CB-208	342.70	342.70	3.70	6.0	Pass	2.3
CBCI-208	262+65.56	12.59	340.83	On Grade	0.05	0.81	#N/A	0.30	0.37	0.07	0.02	2.00	0.80	93.30	0.03	CB-211	336.10	336.10	3.20	6.0	Pass	2.8
CBCI-210	263+98.18	-16.65	331.12	On Grade	0.15	0.77	#N/A	0.83	1.02	0.07	0.03	2.00	1.30	90.50	0.10	CB-355	326.98	326.98	3.50	8.0	Pass	4.5
CBCI-211	264+01.70	12.59	330.98	On Grade	0.08	0.82	#N/A	0.47	0.49	0.07	0.02	2.00	0.80	89.80	0.05	CB-357	327.00	327.00	3.50	6.0	Pass	2.5
CBCI-213	265+72.41	-14.38	311.10	On Grade	0.18	0.85	#N/A	1.07	1.17	0.07	0.04	2.00	1.60	93.40	0.08	CB-359	307.24	307.24	3.20	8.0	Pass	4.8
CBCI-216	268+82.67	11.98	296.20	On Grade	0.09	0.85	#N/A	0.54	0.54	0.07	0.02	2.00	0.90	88.50	0.06	CB-218	293.20	293.20	3.70	6.0	Pass	2.3
CBCI-218	270+56.17	12.00	284.96	On Grade	0.10	0.78	#N/A	0.57	0.63	0.06	0.02	2.00	1.00	84.50	0.10	CB-220	279.45	279.45	4.10	6.0	Pass	1.9
CBCI-220	272+50.38	12.01	276.52	On Grade	0.08	0.78	#N/A	0.67	0.77	0.03	0.02	2.00	1.20	77.60	0.17	CB-221	272.07	272.07	4.90	6.0	Pass	1.1
CBCI-221	273+42.48	11.41	274.07	On Grade	0.06	0.79	#N/A	0.32	0.50	0.02	0.02	2.00	1.10	81.90	0.09	CB-316	269.86	269.86	4.50	6.0	Pass	1.5
CBCI-224	274+42.53	11.41	272.52	On Grade	0.03	0.78	#N/A	0.17	0.20	0.02	0.02	2.00	0.90	90.60	0.02	CB-229	268.38	268.38	3.70	6.0	Pass	2.3
CBCI-229	274+93.17	11.41	272.18	On Grade	0.03	0.79	#N/A	0.18	0.19	0.00	0.02	2.00	1.00	88.30	0.02	CB-230	267.92	267.92	4.30	6.0	Pass	1.7
CBCI-230	275+24.18	11.43	272.12	In Sag	0.04	0.79	#N/A	0.22	0.36	0.00	0.02	2.00	1.30	100.00	0.00	<None>	269.25	269.25	5.60	6.0	Pass	0.4
CBCI-236	276+41.19	11.42	272.90	On Grade	0.79	0.79	#N/A	0.38	4.00	0.01	0.02	2.00	4.00	58.70	0.21	CB-234	269.26	269.26	6.20	6.0	Fail	-0.3
CBCI-239	278+92.58	11.41	279.99	On Grade	0.08	0.87	#N/A	0.47	0.57	0.04	0.02	2.00	1.00	84.40	0.09	CB-236	274.04	276.04	1.9	4.10	Pass	1.9
CBCI-243	280+23.25	12.00	286.16	On Grade	0.08	0.82	#N/A	0.50	0.60	0.05	0.02	2.00	1.00	84.20	0.10	CB-239	281.80	281.80	4.10	6.0	Pass	1.9
CBCI-246	281+66.94	12.01	293.08	On Grade	0.10	0.83	#N/A	0.57	0.63	0.05	0.02	2.00	1.00	83.40	0.11	CB-243	288.80	288.80	4.20	6.0	Pass	1.8
CBCI-250	283+28.81	12.01	300.88	On Grade	0.08	0.67	#N/A	0.50	0.05	0.05	0.02	2.00	0.90	86.90	0.07	CB-246	296.77	296.77	3.80	6.0	Pass	2.2
CBCI-256	286+23.39	11.99	315.08	On Grade	0.10	0.77	#N/A	0.54	0.69	0.05	0.02	2.00	1.00	82.20	0.12	CB-250	311.17	311.17	4.30	6.0	Pass	1.7
CBCI-258	287+88.51	-15.00	322.95	On Grade	0.07	0.90	#N/A	0.42	0.47	0.05	0.03	2.00	1.00	95.90	0.02	CB-371	319.43	319.43	2.90	8.0	Pass	5.1
CBCI-259	287+88.55	11.40	323.05	On Grade	0.10	0.80	#N/A	0.56	0.75	0.05	0.02	2.00	1.10	80.70	0.14	CB-256	319.43	319.43	4.50	6.0	Pass	1.5
CBCI-261	289+51.50	-15.57	330.78	On Grade	0.10	0.90	#N/A	0.65	0.66	0.05	0.03	2.00	1.20	92.20	0.05	CB-258	327.16	327.16	3.30	8.0	Pass	4.7
CBCI-264	289+52.25	11.98	330.93	On Grade	0.10	0.81	#N/A	0.60	0.87	0.05	0.02	2.00	1.10	78.40	0.19	CB-259	327.15	327.15	4.70	6.0	Pass	1.3
CBCI-266	291+27.16	12.01	339.36	On Grade	0.15	0.78	#N/A	0.84	1.06	0.05	0.02	2.00	1.20	75.90	0.27	CB-264	335.56	335.56	5.10	6.0	Pass	0.9
CBCI-268	292+00.92	-14.42	342.84	On Grade	0.07	0.43	#N/A	0.45	0.05	0.03	2.00	1.00	96.30	0.02	CB-261	338.91	338.91	2.90	8.0	Pass	5.1
CBCI-270	293+77.82	-14.96	351.35	On Grade	0.07	0.90	#N/A	0.47	0.48	0.05	0.03	2.00	1.10	96.80	0.02	CB-268	347.53	347.53	2.80	8.0	Pass	5.2
CBCI-271	293+80.00	11.41	351.55	On Grade	0.13	0.79	#N/A	0.73	0.95	0.05	0.02	2.00	1.20	76.80	0.22	CB-266	347.69	347.69	4.90	6.0	Pass	1.1
CBCI-273	295+54.22	-15.00	359.85	On Grade	0.04	0.90	#N/A	0.27	0.38	0.05	0.03	2.00	1.00	97.60	0.01	CB-270	355.50	355.50	2.70	8.0	Pass	5.3
CBCI-275	295+96.59	11.88	361.98	On Grade	0.14	0.80	#N/A	0.79	0.95	0.05	0.02	2.00	1.20	76.90	0.22	CB-271	357.46	357.46	4.90	6.0	Pass	1.1
CBCI-276	296+61.81	-15.10	365.13	On Grade	0.25	0.58	#N/A	0.74	0.76	0.05	0.03	2.00	1.20	89.90	0.08	CB-273	360.44	360.44	3.50	8.0	Pass	4.5
CBCI-278	298+33.91	11.94	373.12	On Grade	0.10	0.72	#N/A	0.51	0.73	0.04	0.02	2.00	1.10	79.50	0.15	CB-275	369.17	369.17	4.60	6.0	Pass	1.4
CBCI-280	299+02.28	-15.57	375.26	On Grade	0.08	0.47	#N/A	0.22	0.46	0.03	0.03	2.00	1.20	93.40	0.03	CB-276	371.27	371.27	3.20	8.0	Pass	4.8
CBCI-281	299+88.58	11.99	377.13	On Grade	0.18	0.53	#N/A	0.63	0.74	0.03	0.02	2.00	1.30	73.10	0.20	CB-278	373.21	373.21	5.60	6.0	Pass	0.4
CBCI-284	301+26.64	-15.58	378.00	On Grade	0.16	0.88	#N/A	0.99	0.99	0.01	0.03	2.00	2.00	75.30	0.24	EX CB-650	374.73	374.73	5.70	8.0	Pass	2.3
CBCI-285	301+66.10	12.00	378.33	On Grade	0.13	0.53	#N/A	0.49	0.49	0.01	0.02	2.00	1.30	76.20	0.12	CB-281	374.67	374.67	5.60	6.0	Pass	0.4
CBCI-286	303+85.90	12.00	378.22	On Grade	0.10	0.58	#N/A	0.42	0.42	0.02	0.02	2.00	1.10	81.80	0.08	CB-290	374.19	374.19	4.60	6.0	Pass	1.4
CBCI-289	304+92.10	-15.58	375.96	On Grade	0.08	0.90	#N/A	0.52	0.52	0.03	0.03	2.00	1.20	92.30	0.04	EX CB-652	371.94	371.94	3.30	8.0	Pass	4.7
CBCI-290	304+92.75	12.00	376.05	On Grade	0.12	0.58	#N/A	0.33	0.38	0.03	0.02	2.00	0.90	97.20	0.05	EX CB-653	372.04	372.04	3.50	8.0	Pass	4.5
CBCI-292	216+55.67	12.09	440.62	On Grade	0.19	0.73	#N/A	1.02	1.24	0.02	0.02	2.00	1.60	65.90	0.42	CB-115	436.73	436.73	6.50	6.0	Fail	-0.5
CBCI-294	219+11.33	-29.50	435.35	On Grade	0.12	0.90	#N/A	0.77	1.05	0.02	0.03	2.00	1.70	79.30	0.22	CB-117	431.48	431.48	4.80	8.0	Pass	3.2
CBCI-295	219+24.92	12.12	435.84	On Grade	0.12	0.52	#N/A	0.46	0.75	0.02	0.02	2.00	1.30	73.90	0.20	CB-118	431.86	431.86	5.40	6.0	Pass	0.6
CBCI-297	222+33.79	-29.48	430.30	On Grade	0.15	0.90	#N/A	0.96	1.14	0.02	0.03	2.00	1.80	78.00	0.25	CB-120	427.28	427.28	4.90	8.0	Pass	3.1
CBCI-298	235+15.92	-29.50	440.65	On Grade	0.18	0.78	#N/A	1.00	1.20	0.02	0.03	2.00	1.50	77.40	0.34	CB-147	436.45	436.45	4.90	8.0	Pass	3.1
CBCI-302	238+10.45	11.50	433.30	On Grade	0.06	0.78	#N/A	0.36	0.58	0.03	0.02	2.00	1.10	81.10	0.11	CB-151	429.43	429.43	4.50	6.0	Pass	1.5
CBCI-303	239+06.54	11.50	430.60	On Grade	0.07	0.75	#N/A	0.35	0.42	0.03	0.02	2.00	0.90	87.00	0.05	CB-152	426.55	426.55	3.90	6.0	Pass	2.1
CBCI-305	246+48.61	-16.95	395.39	On Grade	0.12	0.81	#N/A	0.70	1.03	0.02	0.02	2.00	1.40	71.50	0.29	CB-173	393.29	393.29	5.60	8.0	Pass	2.4
CBCI-308	247+15.47	-15.23	394.41	On Grade	0.04	0.86	#N/A	0.25	0.42	0.01	0.02	2.00	1.10	71.90	0.12	CB-176	391.20	391.20	6.10	8.0	Pass	1.9
CBCI-311	801+07.56	-16.58	389.06	On Grade	0.12	0.45	#N/A	0.39	0.56	0.03	0.04	2.00	1.40	96.90	0.02	CB-192	384.94	384.94	2.80	8.0	Pass	5.2
CBCI-316	273+92.48	11.40	273.15	On Grade	0.03	0.79	#N/A	0.17	0.26	0.02	0.02	2.00	0.90	89.20	0.03	CB-224	268.90	268.90	3.70	6.0	Pass	2.3
CBCI-320	223+89.94	-28.90	428.74	In Sag	0.07	0.90	#N/A	0.47	0.90	0.00	0.03	2.00	2.30	100.00	0.00	<None>	426.70	426.70	6.50	8.0	Pass	1.5
CBCI-336	253+05.82	-25.50	398.13	On Grade	0.21	0.46	#N/A	0.21	0.38	0.02	0.03	2.00	1.20	94.50	0.02	CB-186	394.05	394.05	3.10	8.0	Pass	4.9
CBCI-344	1000+73.76	-8.75	423.26	On Grade	0.44	0.29	#N/A	0.69	0.69	0.02	0.02	2.00	1.20	68.90	0.22	EX CB-603	420.00	420.00	6.10	6.0	Pass	-0.3
CBCI-348	215+32.83	-29.49	443.76	On Grade	0.12	0.90	#N/A	0.75	0.75	0.03	0.03	2.00	1.40	87.50	0.09	CB-114	439.84	439.84	3.80	8.0	Pass	4.2
CBCI-349	237+67.33	-28.49	435.12	On Grade	0.16	0.50	#N/A	0.43	0.63	0.03	0.03	2.00	1.30	89.30	0.07	CB-350	430.91	430.91	3.60	8.0	Pass	4.4
CBCI-350	239+55.61	-28.48	429.28	On Grade	0.17	0.72	#N/A	0.89	0.98	0.05	0.03	2.00	1.40	86.10	0.14	CB-158	425.33	425.33	3.90	8.0	Pass	4.1
CBCI-351	212+31.28	-35.99	446.66	On Grade	0.03	0.90	#N/A	0.22	0.22	0.01	0.03	2.00	1.20	95.00	0.01	OUTFALL G-28	442.64	442.64	3.20	8.0	Pass	4.8
CBCI-353	801+03.13	28.83	387.70	On Grade	0.04	0.76	#N/A	0.23	0.23	0.03	0.04	2.00	1.00	100.00	0.00	CB-192	383.70	383.70	2.00	6.4	Pass	4.4
CBCI-355	264+73.04	-15.05	325.74	On Grade	0.03	0.90	#N/A	0.21	0.31	0.07	0.03	2.00	0.80	99.70	0.00	CB-213	322.01	322.01	2.30	8.0	Pass	5.7
CBCI-357	264+71.85	12.00	326.07	On Grade	0.05	0.80	#N/A	0.26	0.31	0.07	0.01	2.00	0.50	68.70	0.10	CB-213	322.06	322.06	5.80	6.0	Pass	0.2
CBCI-358	205+51.97	-18.33	420.88	On Grade	0.07	0.64	#N/A	0.34	0.34	0.05	0.03	2.00	0.90	98.10	0.01	OUTFALL G-29	416.84	416.84	2.60	10.0	Pass	7.4
CBCI-359	268+30.51	-15.00	299.88	On Grade	0.11	0.86	#N/A	0.66	0.73	0.07	0.03	2.00	1.20	93.90	0.04	CB-360	295.55	295.55	3.10	5.5	Pass	2.4
CBCI-360	270+51.05	-14.41	285.18	On Grade	0.09	0.90	#N/A	0.56	0.60	0.06	0.03	2.00	1.10	94.10	0.04	CB-362	280.96	280.96	3.10	8.0	Pass	4.9
CBCI-362	272+61.77	-15.56	276.06	On Grade	0.08	0.90	#N/A	0.54	0.57	0.03	0.03	2.00	1.20	91.40	0.05	CB-364	272.15	272.15	3.40	8.0	Pass	4.6
CBCI-363	275+24.12	-11.39	272.12	In Sag	0.02	0.90	#N/A	0.13	0.68	0.00	0.02	2.00	1.90	100.00	0.00	<None>	268.38	268.38	7.70	8.0	Pass	0.3
CBCI-364	274+92.15	-11.41	272.18	On Grade	0.09	0.90	#N/A	0.57	0.62	0.02	0.02	2.00	1.60	71.60	0.18	CB-363	268.18	268.18	6.60	10.5	Pass	3.9
CBCI-366	278+96.40	-18.00	279.97	On Grade	0.18	0.77	#N/A	1.01	1.06	0.04	0.03	2.00	1.50	87.70	0.13	CB-377	276.10	276.10	3.80	8.0	Pass	4.2
CBCI-368	281+69.08	-22.00	292.88	On Grade	0.08	0.90	#N/A	0.55	0.63	0.05	0.03	2.00	1.20	92.90	0.04	CB-366	288.82	288.82	3.20	8.0	Pass	4.8
CBCI-369	283+29.33	-19.79	300.67	On Grade	0.11	0.90	#N/A	0.73	0.75	0.05	0.03	2.00	1.20	89.40	0.08	CB-368	296.74	296.74	3.60	8.0	Pass	4.4
CBCI-371	286+19.25	-14.42	314.81	On Grade	0.07	0.89	#N/A	0.45	0.47	0.05	0.03	2.00	1.10	96

Appendix D

Pipe Sizing Design Analysis

HNTB	The HNTB Companies	MADE BY	DCS		DATE:	1/16/2024									JOB NO.	608491			
		CHECKED BY	WJS		DATE:										PAGE NO.				
FOR	ROUTE 16 MENDON	BACKCHECKED BY	DCS		DATE:														

Conduit Analysis

Network Outfall	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Material	Manning's n	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Slope (Calculated) (ft/ft)	Capacity (Design) (cfs)	Flow (cfs)	Flow / Capacity (Design) (%)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Depth to HGL (ft) In	Depth to HGL (ft) Out
EX OUTFALL-50	EX CB-601	EX DMH-600	8.50	12	Concrete	0.01	409.30	409.00	413.52	413.52	3.22	3.22	0.035	8.70	1.17	13.50	7.73	409.76	3.76	3.92
FES-3	EX DMH-661	DMH-373	63	12	Concrete	0.01	391.90	391.24	396.42	396.42	3.52	3.84	0.011	4.77	0.49	10.30	3.91	392.19	4.23	4.62
FES-3	EX CB-662	EX DMH-661	33	12	Concrete	0.01	392.90	392.20	394.45	394.45	0.55	3.22	0.021	6.70	0.25	3.70	4.08	393.11	1.34	4.09
FES-3	EX CB-663	EX DMH-661	7	12	Concrete	0.01	392.50	391.70	396.72	396.72	3.22	3.72	0.120	16.05	0.24	1.50	7.46	392.70	4.02	4.20
EX OUTFALL-51	EX CB-614	EX DMH-613	49	12	Concrete	0.01	424.50	424.30	429.02	429.02	3.52	2.81	0.004	2.95	3.53	119.60	4.49	425.46	3.56	3.01
EX OUTFALL-51	EX CB-615	EX CB-614	25	12	Concrete	0.01	424.90	424.80	427.37	427.37	1.47	3.22	0.004	2.92	0.33	11.30	2.47	425.63	1.74	3.39
<None>	EX CB-616	EX CB-614	609	12	Concrete	0.01	428.00	424.60	433.18	433.18	4.18	3.42	0.006	3.46	(N/A)	(N/A)	(N/A)	(N/A)	US N/A	DS N/A
FES-3	EX CB-667	EX DMH-669	30	12	Concrete	0.01	395.10	394.80	397.93	397.93	1.83	3.21	0.010	4.65	0.19	4.00	2.90	395.28	2.65	4.07
FES-3	EX CB-668	EX DMH-669	15	12	Concrete	0.01	395.10	394.80	397.16	397.16	1.06	3.21	0.020	6.57	0.37	5.60	4.50	395.35	1.81	4.04
HW-1	EX DMH-670	DMH CIT-378	18.80	12	Concrete	0.01	441.20	441.10	445.35	445.35	3.15	4.06	0.005	3.38	2.67	79.00	4.77	441.93	3.42	4.24
EX DMH-658	EX DMH-654	EX DMH-655	88	12	Concrete	0.01	353.70	347.10	360.11	360.11	5.41	5.54	0.075	10.59	1.89	17.80	10.18	354.29	5.82	5.74
EX DMH-658	EX DMH-655	EX DMH-658	75	12	Concrete	0.01	347.10	342.30	353.64	353.64	5.54	N/A	0.064	9.75	2.93	30.00	10.85	347.83	5.81	DS N/A
<None>	EX HW-622	EX CB-623	105.20	48	Concrete	0.01	386.62	385.70	391.54	391.54	N/A	4.52	0.009	134.35	(N/A)	(N/A)	(N/A)	(N/A)	N/A	DS N/A
EX OUTFALL-52	EX CB-618	EX CB-617	28.70	15	Concrete	0.01	391.40	389.20	394.05	394.05	1.40	2.98	0.077	17.90	0.67	3.70	6.97	391.72	2.33	3.83
EX OUTFALL-51	DMH-157	EX DMH-619	159	15	Concrete	0.01	418.50	409.65	423.08	423.08	3.33	3.53	0.056	15.25	11.71	76.80	13.70	419.71	3.37	3.01
EX OUTFALL-51	DMH CIT-164	EX DMH-619	13	12	Concrete	0.01	409.90	409.80	414.22	414.22	3.32	3.63	0.008	3.18	1.29	40.60	1.64	410.90	3.32	3.54
EX OUTFALL-51	CC-3	DMH-168	6	12	Concrete	0.01	398.50	398.43	400.11	400.11	N/A	3.56	0.013	4.00	1.13	28.30	4.38	399.37	N/A	3.62
EX OUTFALL-51	EX CB-623	EX CB-621	53	48	Concrete	0.01	385.30	385.00	394.22	394.22	4.92	5.26	0.006	108.25	17.07	15.80	6.29	388.01	6.21	6.25
EX OUTFALL-51	EX CB-621	EX OUTFALL-51	142	48	Concrete	0.01	385.00	384.00	394.26	394.26	5.26	N/A	0.007	120.68	17.02	14.10	6.79	388.00	6.26	N/A
EX OUTFALL-51	DMH-174	EX CB-623	20	18	Concrete	0.01	388.35	387.90	395.25	395.25	5.40	4.82	0.022	15.66	15.00	95.80	10.09	389.76	5.49	5.06
EX OUTFALL-51	DMH-178	EX CB-623	102	15	Concrete	0.01	389.80	387.10	394.69	394.69	3.64	5.87	0.026	10.49	2.35	22.40	6.89	390.41	4.28	6.20
EX OUTFALL-50	EX CB-605	EX DMH-604	8	15	Concrete	0.01	422.60	422.50	427.37	427.37	3.77	3.84	0.013	4.08	0.86	21.00	4.11	422.99	4.38	4.52
FES-3	DMH CIT-196	EX DMH-630	17	15	Concrete	0.01	373.20	371.10	377.80	377.80	3.35	4.65	0.127	23.03	0.71	3.10	8.50	373.53	4.27	5.18
FES-3	EX DMH-630	DMH-197	129	15	Concrete	0.01	371.00	362.35	377.00	377.00	4.75	3.88	0.067	16.74	3.73	22.30	10.97	371.78	5.22	4.30
<None>	DMH-102	EX DMH-604	226	12	Concrete	0.01	431.44	422.00	438.27	438.27	5.83	4.34	0.042	7.28	(N/A)	(N/A)	(N/A)	(N/A)	US N/A	DS N/A
FES-3	DMH-197	DMH-200	138	15	Concrete	0.01	362.25	352.45	367.48	367.48	3.98	3.82	0.071	17.24	4.53	26.30	11.84	363.11	4.37	4.63
FES-3	DMH-200	DMH-203	141	15	Concrete	0.01	352.35	343.00	357.52	357.52	3.92	2.83	0.066	16.63	4.74	28.50	11.68	353.23	4.29	3.63
FES-3	CBCI-205	DMH-203	4	15	Concrete	0.01	341.91	341.80	347.29	347.29	4.13	4.03	0.028	10.80	0.50	4.70	4.49	342.70	4.59	4.39
FES-3	DMH-203	DMH-206	85.80	15	Concrete	0.01	341.60	336.00	347.09	347.09	4.23	3.21	0.065	16.50	5.59	33.90	12.15	342.56	4.53	3.96
FES-1	EX DMH-606	DMH-102	52	12	Concrete	0.01	433.70	431.44	439.95	439.95	5.25	5.83	0.044	7.46	2.00	26.90	8.05	434.44	5.51	3.93
FES-3	EX DMH-631	DMH-215	154	18	Concrete	0.01	305.90	293.85	311.84	311.84	4.44	3.86	0.078	29.37	7.23	24.60	13.76	306.94	4.90	4.85
FES-8	EX CB-633	EX CB-634	63	15	Concrete	0.01	301.30	299.50	307.79	307.79	5.24	0.76	0.029	10.93	0.00	0.00	0.80	301.32	6.47	2.00
FES-1	EX CB-607	EX DMH-606	8	12	Concrete	0.01	435.70	433.70	440.09	440.09	3.39	5.25	0.257	18.05	0.80	4.40	11.51	436.07	4.02	5.44
FES-6	CBCI-218	EX DMH-635	6	12	Concrete	0.01	279.15	279.10	284.96	284.96	4.81	4.75	0.008	3.22	0.53	16.50	3.03	279.45	5.51	5.47
FES-6	EX DMH-636	EX DMH-637	8	12	Concrete	0.01	271.10	271.00	276.45	276.45	4.35	4.23	0.012	3.98	1.64	41.10	4.81	271.78	4.67	4.43
FES-6	EX DMH-637	CC-4	22	12	Concrete	0.01	271.00	270.20	276.23	276.23	4.23	N/A	0.037	6.83	2.14	31.30	7.69	271.63	4.60	N/A
EX FES-7	DMH-223	EX DMH-641	33	12	Concrete	0.01	268.00	267.20	272.90	272.90	3.90	4.45	0.024	5.57	0.80	14.30	5.03	268.37	4.53	5.19
EX FES-7	EX DMH-228	EX DMH-641	14	12	Concrete	0.01	267.55	267.10	272.60	272.60	4.05	4.55	0.033	6.49	0.53	8.20	4.99	267.85	4.75	5.16
FES-5	DMH CIT-232	EX DMH-643	37	18	Concrete	0.01	267.55	267.30	272.43	272.43	3.37	3.77	0.007	8.70	8.61	99.00	5.61	268.79	3.64	4.00
FES-5	DMH CIT-233	EX DMH-643	27	12	Concrete	0.01	268.00	267.00	272.46	272.46	3.46	4.57	0.037	6.86	1.10	16.00	6.40	268.44	4.02	4.23
EX HW-646	EX DMH-647	DMH-274	54	15	Concrete	0.01	358.90	356.02	364.85	364.85	4.70	4.97	0.053	14.89	3.24	21.80	9.70	359.63	5.22	5.40
EX HW-646	CBCI-276	EX DMH-647	38	12	Concrete	0.01	360.10	359.30	365.13	365.13	4.03	4.55	0.021	5.19	0.68	13.10	4.58	360.44	4.69	5.18
EX HW-646	EX DMH-648	DMH-279	86	15	Concrete	0.01	371.00	368.00	377.33	377.33	5.08	5.86	0.035	12.08	2.35	19.50	7.63	371.61	5.72	6.74
EX HW-646	EX CB-650	DMH-282	20	15	Concrete	0.01	371.80	371.34	377.08	377.08	4.03	4.58	0.023	9.89	0.84	8.50	4.91	372.16	4.92	5.27
EX HW-646	DMH-282	EX DMH-648	7	15	Concrete	0.01	371.34	371.20	377.17	377.17	4.58	4.88	0.020	9.08	1.83	20.20	5.79	371.88	5.29	5.58
EX DMH-658	EX CB-652	EX DMH-651	11	15	Concrete	0.01	361.50	360.90	365.73	365.73	2.98	3.22	0.055	15.16	0.78	5.20	6.50	361.85	3.88	4.27
EX DMH-658	EX CB-653	EX DMH-651	21	15	Concrete	0.01	361.60	360.40	365.36	365.36	2.51	3.72	0.057	15.37	0.79	5.20	6.59	361.95	3.41	4.78
EX DMH-658	EX DMH-651	EX DMH-654	80	12	Concrete	0.01	360.00	354.50	365.37	365.37	4.37	4.61	0.069	9.35	1.90	20.30	9.34	360.59	4.78	5.30
EX DMH-658	EX CB-656	EX DMH-655	6	12	Concrete	0.01	349.00	348.40	353.35	353.35	3.35	4.24	0.102	11.36	0.76	6.70	8.21	349.36	3.99	5.04
EX DMH-658	EX CB-657	EX DMH-655	36	12	Concrete	0.01	352.60	348.40	355.43	355.43	1.82	4.24	0.117	12.18	0.67	5.50	8.30	352.94	2.49	5.08
FES-3	DMH-187	EX DMH-629	62	15	Concrete	0.01	382.60	380.60	388.42	388.42	4.57	3.71	0.032	11.61	2.02	17.40	7.10	383.17	5.25	4.30
EX OUTFALL-51	EX DMH-613	EX DMH-612	13	12	Concrete	0.01	424.00	423.50	428.11	428.11	3.11	3.78	0.037	6.89	3.98	57.70	9.09	424.85	3.26	3.80
EX OUTFALL-50	EX CB-603	DMH-345	18	12	Concrete	0.01	419.90	419.50	422.47	422.47	1.57	2.64	0.022	5.26	0.71	13.50	4.68	420.25	2.22	3.19
EX OUTFALL-52	EX CB-617	EX OUTFALL-52	89	12	Concrete	0.01	389.00	383.31	393.43	393.43	3.43	N/A	0.064	9.03	1.58	17.50	8.65	389.53	3.90	N/A
EX OUTFALL-50	EX DMH-604	EX DMH-602	66.30	12	Concrete	0.01	421.90	418.70	427.34	427.34	4.16	4.44	0.048	7.83	1.08	13.80	7.00	422.34	5.00	4.48
EX OUTFALL-50	EX CB-665	EX DMH-602	29.70	12	Concrete	0.01	419.10	418.90	424.28	424.28	4.18	3.96	0.007	2.92	0.95	32.60	3.32	419.51	4.77	4.47
<None>	DMH CIT-125	DMH CIT-126	30	30	Concrete	0.01	423.60	423.40	429.27	429.27	3.16	3.18	0.007	33.35	(N/A)	(N/A)	(N/A)	(N/A)	US N/A	DS N/A
EX OUTFALL-50	EX DMH-602	DMH-100	81	12	Concrete	0.01	418.70	414.63	423.86	423.86	4.16	4.75	0.050	7.99	2.01	25.20	8.47	419.30	4.56	4.53
EX OUTFALL-50	DMH-100	EX DMH-600	165	12	Concrete	0.01	414.40	406.10	420.38	420.38	4.98	6.12	0.050	7.99	6.09	76.20	11.19	415.36	5.02	4.67
<None>	DMH CIT-126	CC-1	13	30	Concrete	0.01	423.20	422.76	429.08	429.08	3.38	N/A	0.033	74.29	(N/A)	(N/A)	(N/A)	(N/A)	US N/A	N/A
EX OUTFALL-51	EX DMH-608	DMH-300	68	12	Concrete	0.01	436.60	435.36	442.51	442.51	4.91	4.44	0.018	4.82	1.55	32.10	5.46	437.13	5.38	4.66
EX OUTFALL-51	DMH-146	EX DMH-610	31	15	Concrete	0.01	433.35	432.80	438.18	438.18	3.58	3.50	0.018	8.57	6.95	81.10	7.78	434.41	3.77	3.87
EX OUTFALL-51	EX DMH-610	DMH-149	114	15	Concrete	0.01	432.60	429.75	437.55	437.55	3.70	4.04	0.025	10.24	7.21	70.50	9.04	433.67	3.88	4.13
EX OUTFALL-51	DMH-149	DMH-380	53	15	Concrete	0.01	429.65	428.25	435.04	435.04	4.14	4.12	0.026	10.50	8.13	77.40	9.45	430.77	4.27	4.15
EX OUTFALL-51	CBCI-151	EX DMH-671	33	12	Concrete	0.01	427.10	426.80	432.01	432.01	3.91	4.95	0.009	3.42	0.39	11.30	0.49	428.21	3.80	4.55
EX OUTFALL-51	EX DMH-671	DMH-304	59	15	Concrete	0.01	426.30	424.35	432.75	432.75	5.20	5.21	0.033	11.76	9.25	78.60	10.62	427.46	5.29	5.23
EX OUTFALL-51	CBCI-152	EX DMH-612	28	12	Concrete	0.01	423.80	422.30	428.79	428.79	3.99	4.98	0.054	8.31	0.39	4.70	5.42	424.06	4.73	4.44
EX OUTFALL-50	EX DMH-600	EX OUTFALL-50	27	12	Concrete	0.01	405.90	402.34	413.22	413.22	6.32	N/A	0.133	13.01	6.72	51.60	16.70	406.87	6.35	N/A
EX OUTFALL-51	EX DMH-612	DMH-157	104	15	Concrete	0.01	422.20	418.60	428.28	428.28	4.83	3.23	0.035	12.05	11.18	92.80	11.15	423.41	4.87	3.12
EX OUTFALL-52	DMH CIT-160	CC-5	148	12	Concrete	0.01	415.20	407.00	420.79	420.79	4.59	N/A	0.056	8.40	0.23	2.70	4.64	415.40	5.39	N/A
EX OUTFALL-52	CC-5	DMH-352	94.00	12	Concrete	0.01	407.00	401.25	408.23	N/A	0.61	N/A	0.061	8.81	0.22	2.50	4.76	N/A	N/A	3.17
EX OUTFALL-51	GI-163	DMH CIT-164	23.60	12	Concrete	0.01	410.19	410.00	412.71	412.71	N/A	3.22	0.008	3.19	1.30	40.70	3.86	410.95	1.76	3.28
EX OUTFALL-51	EX DMH-619	DMH-168	203.80	15	Concrete	0.01	409.55	398.20	414.43	414.43	3.63	3.54	0.056	15.24	12.57	82.40	13.88	410.77	3.66	3.39
EX OUTFALL-51	CBCI-167	CC-3	4	12	Concrete	0.01	398.53	398.50	402.83	402.83	3.30	N/A	0.008	3.12	1.13	36.40	3.66	399.37	3.46	N/A
EX OUTFALL-51	CBCI-169	DMH-171	7	12	Concrete	0.01	393.00	392.85	397.31	397.31	3.31	3.61	0.023	5.40	1.09	20.20	1.39	395.14	2.17	2.33
EX OUTFALL-51	DMH-171	DMH-306	72	18	Concrete	0.01	392.35	390.50	397.46	397.46	3.61	3.64	0.026	16.80	14.27	85.00	8.08	395.00	2.46	1.97
EX OUTFALL-51	CBCI-173	DMH-323	13	12	Concrete	0.01	390.20	389.75	394.66	394.66	3.46	4.16	0.035	6.69	0.51	7.60	0.65	392.31	2.35	2.60
EX OUTFALL-51	DMH-172	DMH-174	26	18	Concrete	0.01	389.00	388.40	394.63	394.63	4.13	5.35	0.024	16.13	15.02	93.10	8.50	390.83	3.80	4.94
EX OUTFALL-51	DMH-175	DMH-178	39	12	Concrete	0.01	389.96	389.80	394.30	394.30	3.34	3.89	0.004	2.30	0.96	41.80	2.79	390.49	3.81	4.23
EX OUTFALL-51	CBCI-177	DMH-175	22	12	Concrete	0.01	390.20	390.06	394.43	394.43	3.23	3.24	0.007	2.87	0.41	14.40	2.60	390.50	3.93	3.79
EX OUTFALL-51	CBCI-176	DMH-175	26	12	Concrete	0.01	390.10	389.96	394.18	394.18	3.08	3.34	0.005	2.60	0.55	21.30	2.63	390.52	3.66	3.78
EX OUTFALL-51	DGCB-180	DMH-178	10	12	Concrete	0.01	390.05	390.00	394.12	394.12	3.07	3.69	0.005	2.49	0.60	24.20	2.61	390.50	3.62	4.19
EX OUTFALL-51	DGCB-179	DMH-178	14	12	Concrete	0.01	389.90	389.80	394.13	394.13	3.23	3.89	0.007	3.07	0.25	8.30	2.37	390.47	3.66	4.22
EX OUTFALL-51	DMH-181	DMH-309	75	12	Concrete	0.01	391.15	390.60	395.81	395.81	3.66	3.63	0.007	3.05	1.02	33.50	3.50	391.57	4.24	4.20
EX OUTFALL-51	DGCB-182	DMH-181	7	12	Concrete	0.01	391.40	391.25	395.68	395.68	3.28	3.56	0.020	5.10	0.73	14.40	4.61	391.76	3.92	4.18
EX OUTFALL-51	DMH-183	DMH-181	106	12	Concrete	0.01	392.20	391.25	397.25	397.25	4.05	3.56	0.009	3.37	0.59	17.50	3.22	392.52	4.73	4.19
EX OUTFALL-51	CBCI-184	DMH-183	25	12	Concrete	0.01	393.40	392.75	397.69	397.69	3.29	3.50	0.026	5.79	0.38	6.60	4.16	393.65	4.04	4.33
EX OUTFALL-51	CBCI-185	DMH-183	50	12	Concrete	0.01	393.60	392.30	397.86	397.86	3.26	3.94	0.026	5.76	0.34	5.80	4.00	393.84	4.02	4.71
FES-3	CBCI-186	DMH-193	10	12	Concrete	0.01	385.92	385.70	390.72	390.72	3.80	3.87	0.022	5.30	0.64	12.10	4.56	386.25	4.47	4.42
EX OUTFALL-50	CB-381	DMH-100	68	12	Concrete	0.01	418.00	414.50	421.51	421.51	2.51	4.88	0.052	8.09	3.90	48.20	10.21	418.84	2.67	4.48
FES-3	CBCI-190	DMH-193	23	12	Concrete	0.01	385.85	385.70	390.15	390.15	3.30	3.87	0.007	2.89	0.73	25.10	3.06	386.21	3.94	4.42
FES-3	CBCI-195	DMH CIT-196	36	12	Concrete	0.01	374.65	373.30	379.13	379.13	3.48	3.50	0.038	6.93	0.72	10.40	5.71	375.00	4.13	4.28
FES-3	CBCI-198	DMH-197	29	12	Concrete	0.01	362.70	362.50	367.25	367.25	3.55	3.98	0.007	2.96	1.20	40.70	3.57	363.16	4.09	4.31
FES-3	CBCI-199	DMH-197	7	12	Concrete	0.01	363.00	362.50	367.54	367.54	3.54	3.98	0.076	9.81	0.26	2.70	5.39	363.21	4.33	4.32
FES-3	CBCI-202	DMH-200	5	12	Concrete	0.01	352.80	352.60	357.58	357.58	3.78	3.92	0.037	6.89	0.44	6.30	4.91	353.28	4.30	4.23
FES-3	CBCI-204	DMH-203	29	12	Concrete	0.01	342.70	341.85	347.15	347.15	3.45	4.23	0.029	6.07	1.16	19.20	5.96	343.15	4.00	4.46
FES-1	CBCI-103	DMH-102	8	12	Concrete	0.01	433.80	433.70	438.09	438.09	3.29	3.57	0.013	4.09	0.26	6.30	2.91	434.23	3.86	4.04
FES-3	CBCI-208	DMH-206	5	12	Concrete	0.01	335.50	335.15	340.83	340.83	4.33	4.31	0.076	9.83	0.35	3.50	5.89	336.10	4.73	4.36
FES-3	DMH-206	DMH-209	128	15	Concrete	0.01	334.90	326.00	340.46	340.46	4.31	3.66	0.069	17.02	5.76	33.80	12.52	335.87	4.59	3.89
FES-3	CBCI-211	DMH-209	7	12	Concrete	0.01	326.25	326.15	330.98	330.98	3.73	3.76	0.015	4.31	0.44	10.30	3.54	327.00	3.98	3.91
FES-3	CBCI-210	DMH-209	24	12	Concrete	0.01	326.40	326.15	331.12	331.12	3.72	3.76	0.011	3.65	0.93	25.40	3.88	326.98	4.14	3.92
FES-3	DMH-209	DMH-356	68	15	Concrete	0.01	325.90	321.05	330.91	330.91	3.76	3.61	0.071	17.22	6.45	37.40	13.02	326.92	3.99	3.82
FES-3	CBCI-213	EX DMH-631	34	12	Concrete	0.01	306.80	306.15	311.10	311.10	3.30	4.69	0.019	4.90	1.10	22.30	5.02	307.24	3.86	4.84
FES-3	DMH-215	FES-3	12	18	Concrete	0.01	291.35	291.25	299.21	N/A	6.36	N/A	0.008	9.45	7.80	82.50	4.41	292.94	6.27	N/A
FES-3	CBCI-216	DMH-215	46	12	Concrete	0.01	291.75	291.50	296.20	296.20	3.45	6.71	0.005	2.63	0.48	18.30	0.61	293.20	3.00	6.02
FES-6	CBCI-220	EX DMH-636	5	12	Concrete	0.01	271.75	271.50	276.52	276.52	3.76	3.95	0.057	8.47	0.59	7.00	6.22	272.07	4.45	4.61
FES-6	CC-4	FES-6	12	12	Concrete	0.01	270.20	269.71	271.43	271.43	N/A	N/A	0.041	7.20	2.13	29.60	7.99	270.82	N/A	N/A
EX FES-7	CBCI-224	DMH-223	14	12	Concrete	0.01	268.20	268.10	272.52	272.52	3.32	3.80	0.007	3.05	0.18	5.90	2.12	268.38	4.14	4.51
FES-1	DMH-102	FES-1	75	12	Concrete	0.01	433.60	433.00	438.27	438.27	3.67	N/A	0.008	3.19	2.02	63.30	4.30	434.21	4.06	N/A
EX FES-7	CBCI-229	DMH-228	15	12	Concrete	0.01	267.75	267.65	272.18	272.18	3.43	3.95	0.007	2.91	0.17	5.90	2.03	267.92	4.26	4.73
EX FES-7	CBCI-230	DMH-228	28	12	Concrete	0.01	269.00	268.00	272.12	272.12	2.11	3.60	0.036	6.78	0.36	5.40	4.60	269.25	2.87	4.44
FES-1	CBCI-101	DMH-104	7	12	Concrete	0.01	439.15	438.90	443.30	443.30	3.15	3.80	0.037	6.88	0.70	10.20	5.63	439.50	3.80	4.38
FES-5	DGCB-234	DMH CIT-233	18	12	Concrete	0.01	268.08	268.00	272.17	272.17	3.09	3.46	0.004	2.37	0.37	15.60	2.20	268.48	3.69	3.98
FES-5	DMH-237	DMH CIT-232	324	15	Concrete	0.01	274.50	267.80	280.21	280.21	4.46	3.37	0.021	9.30	8.44	90.80	8.58	275.63	4.58	3.39
FES-5	CBCI-239	DMH-237	13	12	Concrete	0.01	275.75	275.00	279.99	279.99	3.24	4.21	0.060	8.73	0.48	5.50	5.95	276.04	3.95	4.53
FES-5	CBCI-243	DMH-242	13	12	Concrete	0.01	281.50	281.00	286.16	286.16	3.66	4.00	0.039	6.99	0.51	7.30	5.18	281.80	4.36	4.28
FES-1	DMH-346	EX DMH-606	18	12	Concrete	0.01	435.00	433.80	440.92	440.92	4.92	5.15	0.066	9.16	1.25	13.70	8.17	435.47	5.45	5.46
FES-5	DMH-242	DMH-237	120.80	15	Concrete	0.01	280.20	274.60	286.00	286.00	4.55	4.35	0.046	13.91	7.33	52.70	11.49	281.28	4.72	4.42
FES-5	DMH-244	DMH-242	148	12	Concrete	0.01	287.70	280.50	293.22	293.22	4.52	4.50	0.049	7.85	7.00	89.20	11.30	288.68	4.54	4.76
FES-5	CBCI-246	DMH-244	14	12	Concrete	0.01	288.50	287.80	293.08	293.08	3.57	4.42	0.051	8.06	0.53	6.60

HNTB	The HNTB Companies	MADE BY	DCS		DATE:	1/16/2024									JOB NO.	608491				
		CHECKED BY	WJS		DATE:										PAGE NO.					
FOR	ROUTE 16 MENDON	BACKCHECKED BY	DCS		DATE:															

Conduit Analysis

Network Outfall	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Material	Manning's n	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Slope (Calculated) (ft/ft)	Capacity (Design) (cfs)	Flow (cfs)	Flow / Capacity (Design) (%)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Depth to HGL (ft) In	Depth to HGL (ft) Out
FES-5	CBCI-261	DMH-262	9	12	Concrete	0.01	326.45	326.40	330.78	330.78	3.33	3.49	0.006	2.70	0.61	22.70	2.78	327.16	3.62	3.73
FES-5	CBCI-264	DMH-262	16	12	Concrete	0.01	326.60	326.40	330.93	330.93	3.33	3.49	0.012	3.95	0.68	17.20	3.77	327.15	3.78	3.73
FES-5	CBCI-266	DMH-265	18	12	Concrete	0.01	335.15	334.98	339.36	339.36	3.21	3.31	0.009	3.44	0.80	23.20	3.56	335.56	3.80	3.70
FES-5	CBCI-268	DMH-267	6	12	Concrete	0.01	338.50	338.45	342.84	342.84	3.34	3.48	0.008	3.14	0.43	13.80	2.81	338.91	3.93	4.01
FES-5	CBCI-270	DMH-269	9	12	Concrete	0.01	347.25	347.00	351.35	351.35	3.10	3.27	0.028	5.97	0.46	7.70	4.51	347.53	3.82	3.87
FES-5	CBCI-271	DMH-269	18	12	Concrete	0.01	347.33	347.00	351.55	351.55	3.22	3.27	0.019	4.87	0.73	15.00	4.46	347.69	3.86	3.86
EX HW-646	CBCI-275	DMH-274	7	12	Concrete	0.01	357.10	357.00	361.98	361.98	3.88	4.24	0.014	4.23	0.73	17.20	4.03	357.46	4.52	4.95
FES-1	CBCI-106	DMH CIT-105	18	12	Concrete	0.01	440.45	440.00	444.97	444.97	3.51	3.82	0.025	5.61	0.40	7.20	4.15	440.71	4.26	4.65
EX HW-646	DMH-277	EX DMH-647	179	15	Concrete	0.01	367.10	359.00	373.21	373.21	4.86	4.60	0.045	13.74	3.20	23.30	9.12	367.82	5.39	5.44
EX HW-646	CBCI-278	DMH-277	4	12	Concrete	0.01	368.85	368.80	373.12	373.12	3.27	3.41	0.012	3.84	0.58	15.20	3.53	369.17	3.95	4.13
EX HW-646	DMH-279	DMH-277	62	15	Concrete	0.01	367.90	367.20	375.11	375.11	5.96	4.76	0.011	6.87	2.74	39.90	5.28	368.56	6.55	5.31
EX HW-646	CBCI-280	DMH-279	28	12	Concrete	0.01	371.00	369.00	375.26	375.26	3.26	5.11	0.072	9.58	0.43	4.50	6.17	371.27	3.99	5.97
EX HW-646	CBCI-281	EX DMH-648	10	12	Concrete	0.01	372.90	372.80	377.13	377.13	3.23	3.53	0.011	3.65	0.54	14.80	3.33	373.21	3.92	4.27
EX HW-646	CBCI-284	DMH-283	19	12	Concrete	0.01	373.30	373.10	378.00	378.00	3.70	4.08	0.011	3.65	0.75	20.40	0.95	374.73	3.27	3.46
EX HW-646	DMH-283	DMH-282	132	12	Concrete	0.01	374.20	372.90	378.18	378.18	2.98	3.27	0.010	3.54	1.08	30.60	3.96	374.64	3.54	3.89
EX HW-646	CBCI-285	DMH-283	45	12	Concrete	0.01	374.05	373.10	378.33	378.33	3.28	4.08	0.021	5.20	0.37	7.20	3.84	374.67	3.66	3.51
EX DMH-658	CBCI-289	DMH-288	10	12	Concrete	0.01	371.65	371.50	375.96	375.96	3.31	3.61	0.015	4.33	0.48	11.00	3.63	371.94	4.02	4.39
EX DMH-658	CBCI-290	DMH-288	18	12	Concrete	0.01	371.80	371.00	376.05	376.05	3.25	4.11	0.045	7.52	0.33	4.50	4.82	372.04	4.01	4.98
EX DMH-658	DMH-288	EX DMH-651	242	12	Concrete	0.01	370.70	360.40	376.12	376.12	4.41	3.97	0.043	7.35	0.89	12.10	6.33	371.10	5.02	4.73
HW-3	DGCB-111	DMH-112	32	12	Concrete	0.01	438.75	438.60	443.04	443.04	3.29	3.52	0.005	2.45	1.32	54.00	3.18	439.28	3.76	3.93
FES-3	CBCI-189	DMH-337	27	12	Concrete	0.01	392.30	392.10	396.59	396.59	3.28	3.82	0.007	3.06	0.62	20.20	3.05	392.63	3.96	4.52
HW-3	DMH-112	DMH-291	116	12	Concrete	0.01	438.50	435.85	443.12	443.12	3.62	3.59	0.023	5.38	1.96	36.40	6.32	439.10	4.02	3.89
HW-3	CBCI-114	DMH-113	12	12	Concrete	0.01	433.50	432.90	437.71	437.71	3.21	3.93	0.051	8.04	0.94	11.70	6.85	433.91	3.80	3.99
HW-3	CBCI-115	DMH-113	27	12	Concrete	0.01	433.50	432.90	437.99	437.99	3.49	3.93	0.022	5.31	0.68	12.80	4.65	433.84	4.15	4.11
HW-3	DMH-113	DMH-293	126	12	Concrete	0.01	432.80	430.80	437.83	437.83	4.03	3.78	0.016	4.49	4.21	93.80	6.49	433.67	4.16	4.01
HW-3	CBCI-117	DMH-116	12	12	Concrete	0.01	429.20	429.00	433.23	433.23	3.03	3.44	0.017	4.67	0.75	16.10	4.36	429.82	3.41	3.61
HW-3	CBCI-118	DMH-116	30	12	Concrete	0.01	429.10	428.65	433.62	433.62	3.51	3.79	0.015	4.33	0.50	11.60	3.68	429.39	4.23	3.99
HW-3	DMH-116	DMH-296	173	15	Concrete	0.01	428.40	425.85	433.44	433.44	3.79	3.42	0.015	7.85	6.47	82.50	7.14	429.43	4.01	3.22
HW-3	CBCI-120	DMH-119	10	12	Concrete	0.01	424.80	424.75	428.89	428.89	3.09	3.36	0.005	2.55	0.75	29.50	0.96	426.61	2.28	2.51
HW-3	DGCB-121	DMH-119	31	12	Concrete	0.01	425.05	424.75	429.29	429.29	3.24	3.36	0.010	3.48	0.51	14.60	0.65	426.60	2.69	2.51
HW-3	DMH-119	DMH-321	49	18	Concrete	0.01	424.25	423.75	429.11	429.11	3.36	3.70	0.010	10.60	8.62	81.30	4.88	426.58	2.53	2.70
HW-3	CBCI-123	DMH-122	10	12	Concrete	0.01	424.30	423.90	428.78	428.78	3.47	4.09	0.041	7.22	0.83	11.60	1.06	426.55	2.23	2.45
HW-3	DGCB-124	DMH-122	31	12	Concrete	0.01	425.00	423.90	429.15	429.15	3.15	4.09	0.035	6.68	0.82	12.30	1.05	426.56	2.59	2.45
HW-1	CBCI-128	DMH-127	10	12	Concrete	0.01	425.60	425.50	429.77	429.77	3.17	3.45	0.010	3.51	1.25	35.50	4.08	426.58	3.19	3.38
HW-1	DGCB-129	DMH-127	31	12	Concrete	0.01	426.00	425.50	430.14	430.14	3.14	3.45	0.016	4.53	0.54	11.80	3.88	426.53	3.61	3.41
HW-1	CBCI-132	DMH-130	31	12	Concrete	0.01	429.51	428.60	433.90	433.90	3.39	3.98	0.029	6.10	0.16	2.70	3.36	429.68	4.22	4.46
HW-1	DMH-130	DMH-375	10	18	Concrete	0.01	428.10	427.90	433.58	433.58	3.98	3.78	0.019	14.65	6.85	46.80	8.16	429.11	4.47	4.17
HW-1	CBCI-131	DMH-130	10	12	Concrete	0.01	428.90	428.60	433.41	433.41	3.51	3.98	0.030	6.13	1.91	31.10	6.90	429.49	3.92	4.55
<None>	CC-1	HW-2	15	30	Concrete	0.01	422.76	422.30	426.07	426.07	N/A	N/A	0.031	72.64	(N/A)	(N/A)	(N/A)	(N/A)	N/A	N/A
HW-1	DMH CIT-133	DMH-338	73	15	Concrete	0.01	436.10	432.70	440.40	440.40	3.05	3.98	0.046	13.92	5.54	39.80	10.70	437.05	3.35	4.68
HW-1	CBCI-134	DMH CIT-133	8	12	Concrete	0.01	436.15	436.10	440.23	440.23	3.08	3.30	0.006	2.83	1.94	68.40	2.47	437.21	3.02	3.21
HW-1	CBCI-139	DMH-138	7	12	Concrete	0.01	440.95	440.85	445.12	445.12	3.17	3.53	0.014	4.20	0.47	11.10	3.53	441.23	3.89	4.14
HW-1	CBCI-143	DMH-142	22	12	Concrete	0.01	443.35	442.15	447.60	447.60	3.25	3.37	0.056	8.40	0.12	1.50	3.86	443.49	4.11	4.18
HW-1	CBCI-144	DMH-142	47	12	Concrete	0.01	443.15	442.15	447.42	447.42	3.27	3.37	0.021	5.20	0.31	5.90	3.62	443.38	4.04	4.21
EX OUTFALL-51	CBCI-147	DMH-146	7	12	Concrete	0.01	433.60	433.45	438.08	438.08	3.48	3.73	0.022	5.31	0.82	15.50	4.91	434.49	3.59	3.69
EX OUTFALL-51	CBCI-148	EX DMH-610	33	12	Concrete	0.01	433.05	432.85	437.33	437.33	3.28	3.70	0.006	2.80	0.40	14.30	2.53	433.72	3.61	3.83
EX OUTFALL-51	CBCI-150	DMH-149	33	12	Concrete	0.01	430.35	429.80	434.60	434.60	3.25	4.24	0.017	4.63	0.64	13.80	4.14	430.81	3.79	4.21
EX OUTFALL-51	CBCI-158	DMH-157	14	12	Concrete	0.01	418.85	418.75	422.93	422.93	3.08	3.33	0.007	2.98	0.96	32.20	3.38	419.82	3.11	3.27
EX OUTFALL-52	CBCI-159	DMH CIT-160	91	12	Concrete	0.01	420.00	415.30	425.00	425.00	4.00	4.49	0.051	8.08	2.90	23.80	4.54	420.20	4.80	5.37
HW-3	DMH-291	DMH-113	137	12	Concrete	0.01	435.75	432.90	440.44	440.44	3.69	3.93	0.021	5.14	2.72	52.90	6.64	436.46	3.98	3.98
HW-3	CBCI-292	DMH-291	30	12	Concrete	0.01	436.35	436.00	440.62	440.62	3.27	3.44	0.012	3.86	0.82	21.20	3.90	436.73	3.89	3.92
EX OUTFALL-51	CBCI-302	DMH-380	34	12	Concrete	0.01	429.00	428.25	433.30	433.30	3.30	4.37	0.022	5.26	0.47	8.90	4.14	429.43	3.87	4.17
EX OUTFALL-51	DMH-304	EX DMH-612	59	15	Concrete	0.01	424.25	422.30	430.81	430.81	5.31	4.73	0.033	11.79	9.44	80.10	10.68	425.42	5.39	4.50
FES-6	EX DMH-635	EX DMH-636	193	12	Concrete	0.01	278.60	271.30	284.85	284.85	5.25	4.15	0.038	6.94	1.09	15.80	6.44	279.04	5.81	4.63
EX OUTFALL-51	DMH-300	DMH-340	63	12	Concrete	0.01	435.36	434.18	440.80	440.80	4.44	4.13	0.019	4.89	2.67	54.60	6.36	436.06	4.74	3.84
EX OUTFALL-51	DMH-306	DMH-323	37	18	Concrete	0.01	390.40	389.60	395.64	395.64	3.74	3.81	0.022	15.47	14.62	94.50	8.27	393.17	2.47	2.45
EX OUTFALL-51	DMH-309	DMH-178	66	12	Concrete	0.01	390.50	389.90	395.23	395.23	3.73	3.79	0.009	3.41	1.28	37.70	4.03	390.98	4.25	4.18
EX FES-7	DMH-315	DMH-223	46	12	Concrete	0.01	268.50	268.10	273.54	273.54	4.04	3.80	0.009	3.31	0.63	19.10	3.25	268.83	4.71	4.50
HW-3	CBCI-294	DMH-293	11	12	Concrete	0.01	431.10	430.80	435.35	435.35	3.25	3.78	0.027	5.83	0.83	14.30	5.26	431.48	3.87	4.04
HW-3	CBCI-295	DMH-293	31	12	Concrete	0.01	431.55	430.80	435.84	435.84	3.29	3.78	0.024	5.50	0.55	10.10	4.49	431.86	3.98	4.04
HW-3	CBCI-297	DMH-296	10	12	Concrete	0.01	426.10	426.00	430.30	430.30	3.20	3.52	0.010	3.63	0.89	24.50	1.13	427.28	3.02	3.25
HW-3	DGCB-298	DMH-296	32	12	Concrete	0.01	426.50	426.00	430.80	430.80	3.30	3.52	0.016	4.45	0.70	15.80	4.13	427.28	3.52	3.24
EX OUTFALL-51	CBCI-299	DMH-300	6	12	Concrete	0.01	436.00	435.46	440.65	440.65	3.65	4.34	0.087	10.50	1.16	11.10	8.81	436.45	4.20	4.65
EX OUTFALL-51	CBCI-303	DMH-304	29	12	Concrete	0.01	426.30	424.50	430.60	430.60	3.30	5.31	0.061	8.83	0.37	4.10	5.53	426.55	4.05	5.33
EX OUTFALL-51	CBCI-308	DMH-172	11	12	Concrete	0.01	389.90	389.50	394.41	394.41	3.50	4.13	0.035	6.69	0.30	4.50	0.38	391.20	3.21	3.43
EX OUTFALL-51	CBCI-305	DMH-306	15	12	Concrete	0.01	390.90	390.65	395.39	395.39	3.49	3.99	0.017	4.58	0.74	16.10	0.94	393.29	2.10	2.36
EX OUTFALL-51	DGCB-310	DMH-309	14	12	Concrete	0.01	390.75	390.60	394.74	394.74	2.99	3.63	0.011	3.70	0.47	12.60	3.22	391.03	3.71	4.21
FES-3	CBCI-311	DMH-354	33	12	Concrete	0.01	384.63	383.00	389.06	389.06	3.43	3.40	0.050	7.95	0.54	6.80	5.79	384.94	4.12	4.22
EX FES-7	CBCI-316	DMH-315	12	12	Concrete	0.01	268.70	268.60	273.15	273.15	3.45	3.94	0.008	3.20	0.24	7.30	2.38	268.90	4.25	4.69
HW-3	DGCB-319	DMH-321	29	12	Concrete	0.01	424.85	424.40	429.12	429.12	3.26	3.55	0.015	4.42	0.77	17.50	0.98	426.71	2.41	2.25
HW-3	CBCI-320	DMH-321	6	12	Concrete	0.01	424.60	424.40	428.74	428.74	3.14	3.55	0.035	6.62	0.90	13.60	1.14	426.70	2.04	2.25
HW-3	DMH-293	DMH-116	129	15	Concrete	0.01	430.55	428.50	435.58	435.58	3.78	3.69	0.016	8.16	5.42	66.50	7.11	431.49	4.09	3.91
HW-3	DMH-296	DMH-119	110	18	Concrete	0.01	425.60	424.35	430.52	430.52	3.42	3.26	0.011	11.22	7.73	68.90	4.37	427.25	3.27	2.45
HW-3	DMH-321	DMH-122	23	18	Concrete	0.01	423.65	423.30	428.95	428.95	3.80	4.19	0.015	13.07	9.95	76.10	5.63	426.16	2.79	3.04
FES-8	EX CB-634	FES-8	46	15	Concrete	0.01	297.30	291.00	301.51	301.51	2.96	N/A	0.136	23.80	0.00	0.00	1.81	297.33	4.18	N/A
HW-3	DMH-324	HW-3	29	18	Concrete	0.01	423.15	422.80	429.03	429.03	4.38	N/A	0.012	11.64	11.31	97.10	6.40	425.13	3.90	N/A
HW-1	DMH-127	HW-1	83	18	Concrete	0.01	424.90	422.80	429.95	429.95	3.55	N/A	0.025	16.72	9.76	58.40	9.83	426.11	3.84	N/A
FES-5	EX DMH-643	FES-5	20	18	Concrete	0.01	267.00	266.70	272.57	272.57	4.07	N/A	0.015	12.76	10.00	78.40	7.99	268.22	4.35	N/A
EX OUTFALL-51	DMH-168	DMH-171	127	18	Concrete	0.01	397.95	392.45	402.99	402.99	3.54	3.51	0.043	21.85	13.63	62.40	13.04	399.32	3.67	2.22
HW-3	DMH-122	DMH-324	9	18	Concrete	0.01	423.30	423.15	428.99	428.99	4.19	4.38	0.016	13.45	11.32	84.20	6.41	425.83	3.16	3.30
FES-3	DMH-193	DMH-187	39	12	Concrete	0.01	385.60	382.85	390.57	390.57	3.97	4.57	0.070	9.42	1.42	15.00	8.64	386.10	4.47	5.31
HW-1	DI-331	DMH-338	45	12	Concrete	0.01	435.25	432.85	439.45	439.45	3.19	4.08	0.054	8.26	0.12	1.40	3.79	435.39	4.06	4.39
FES-3	EX DMH-629	DMH-335	33	15	Concrete	0.01	380.60	379.35	385.56	385.56	3.71	3.57	0.038	12.51	2.43	19.40	7.89	381.22	4.34	4.16
FES-3	DMH-335	EX DMH-630	129	15	Concrete	0.01	379.25	371.10	384.17	384.17	3.67	4.65	0.063	16.24	3.15	19.40	10.24	379.96	4.21	5.14
EX OUTFALL-50	DMH-345	EX CB-665	14	12	Concrete	0.01	419.50	419.20	423.14	423.14	2.64	4.08	0.021	5.15	0.99	19.20	5.06	419.92	3.22	4.77
FES-6	CC-6	EX DMH-635	16	12	Concrete	0.01	280.60	278.80	282.00	282.00	N/A	5.05	0.112	11.90	0.56	4.70	7.77	280.91	N/A	5.90
EX FES-7	EX DMH-666	EX DMH-641	21	12	Concrete	0.01	267.80	267.00	272.39	272.39	3.59	4.65	0.039	7.02	0.44	6.30	5.00	268.08	4.31	5.12
EX OUTFALL-51	DMH-340	DMH-146	45	15	Concrete	0.01	434.18	433.35	439.32	439.32	3.88	3.58	0.018	8.75	7.90	90.30	8.08	435.29	4.03	3.68
EX OUTFALL-52	DMH-352	EX CB-617	194	12	Concrete	0.01	401.25	389.50	404.79	404.79	2.54	2.93	0.060	8.76	0.66	7.50	6.55	401.59	3.20	3.74
FES-3	DMH-356	EX DMH-631	205	15	Concrete	0.01	320.95	306.00	325.92	325.92	3.72	4.58	0.073	17.44	6.71	38.40	13.29	321.99	3.93	5.30
FES-3	DMH-354	EX DMH-629	62	12	Concrete	0.01	382.90	380.85	387.40	387.40	3.50	3.71	0.033	6.49	0.77	11.90	5.56	383.27	4.13	4.29
FES-3	DMH-337	DMH-193	159	12	Concrete	0.01	392.00	385.70	396.92	396.92	3.92	3.87	0.040	7.10	0.69	9.80	5.74	392.35	4.57	4.41
EX OUTFALL-51	DI-413	DMH-340	15	12	Concrete	0.01	434.40	434.28	437.92	437.92	2.52	4.04	0.008	3.14	5.41	172.00	6.88	435.99	1.93	3.68
FES-3	CBCI-336	DMH-337	34	12	Concrete	0.01	393.80	392.10	398.13	398.13	3.33	3.82	0.050	7.94	4.50	114.60	5.12	394.05	4.08	4.54
EX OUTFALL-50	CBCI-344	DMH-345	32	10	Concrete	0.01	419.65	419.50	423.26	423.26	2.78	2.80	0.005	1.50	0.48	31.90	2.44	420.00	3.26	3.18
FES-1	DI-380	DMH-102	19	12	Concrete	0.01	435.25	434.10	439.50	439.50	3.25	3.17	0.060	8.70	0.19	2.20	4.51	435.43	4.07	3.99
FES-1	DMH-104	DMH-346	101	12	Concrete	0.01	438.80	435.10	443.70	443.70	3.90	4.82	0.037	6.81	1.27	18.70	6.64	439.28	4.42	5.53
HW-3	CBCI-348	DMH-112	20	12	Concrete	0.01	439.50	438.60	443.76	443.76	3.26	3.52	0.045	7.52	0.65	8.70	5.88	439.84	3.92	3.97
EX OUTFALL-51	CBCI-349	DMH-149	9	12	Concrete	0.01	430.60	429.80	435.12	435.12	3.52	4.24	0.094	10.90	0.57	5.20	7.31	430.91	4.21	4.20
EX OUTFALL-51	CBCI-350	EX DMH-613	15	12	Concrete	0.01	424.95	424.00	429.28	429.28	3.33	3.11	0.063	8.96	0.84	9.40	7.16	425.33	3.95	3.17
FES-1	CBCI-351	DMH CIT-105	47	12	Concrete	0.01	442.45	440.00	446.66	446.66	3.21	3.82	0.052	8.12	0.21	2.60	4.42	442.64	4.02	4.59
EX OUTFALL-52	CBCI-162	DMH-352	8	12	Concrete	0.01	401.60	401.25	405.93	405.93	3.33	2.54	0.043	7.42	0.25	3.40	4.38	401.81	4.12	3.17
FES-3	CBCI-192	DMH-335	13	12	Concrete	0.01	380.00	379.50	384.22	384.22	3.21	3.67	0.038	6.95	1.36	19.50	6.86	380.49	3.73	4.14
FES-3	CBCI-353	DMH-354	31	12	Concrete	0.01	383.50	383.00	387.70	387.70	3.20	3.40	0.016	4.55	0.23	5.10	3.05	383.70	4.00	4.12
EX OUTFALL-50	CBCI-358	DMH-100	43	12	Concrete	0.01	416.60	414.50	420.88	420.88	3.28	4.88	0.049	7.85	0.34	4.30	4.98	416.84	4.04	4.92
FES-3	CBCI-357	DMH-356	3	12	Concrete	0.01	321.25	321.20	326.07	326.07	3.82	3.72	0.019	4.89	0.21	4.40	3.12	322.06	4.01	3.86
FES-3	CBCI-359	DMH-215	45	12	Concrete	0.01	295.20	293.35	299.88	299.88	3.68	4.86	0.042	7.26	0.69	9.50	5.82	295.55	4.33	5.65
FES-6	CBCI-362	EX DMH-637	22	12	Concrete	0.01	271.82	271.73	276.06	276.06	3.24	3.50	0.004	2.23	0.52	23.60	2.32	272.15	3.91	4.20
FES-5	CBCI-363	EX DMH-643	39	12	Concrete	0.01	267.65	267.30	272.12	272.12	3.47	4.27	0.009	3.37	0.68	20.10	3.35	268.38	3.74	4.20
EX FES-7	CBCI-364	EX DMH-666	14	12	Concrete	0.01	267.90	267.80	272.18	272.18	3.28	3.59	0.007	3.06	0.45	14.60	2.78	268.18	4.00	4.30
FES-5	CBCI-366	DMH-237	18	12	Concrete	0.01	275.70	275.00	279.97	279.97	3.26	4.21	0.039	7.04	0.93	13.20	6.21	276.10	3.87	4.50
FES-5	CBCI-368	DMH-244	21	12	Concrete	0.01	288.50	288.00	292.88	292.88	3.38	4.22	0.024	5.54	0.58	10.60	4.58	288.82	4.06	4.45
FES-5	CBCI-369	DMH-249	16	12	Concrete	0.01	296.40	295.70	300.67	300.67	3.27	4.26	0.045	7.52	0.67	8.90	5.92	296.74	3.93	4.32
FES-5	CBCI-371	DMH-254	10	12	Concrete	0.01	310.58	310.20	314.81	314.81	3.23	3.83	0.040	7.14	0.45	6.30	5.08	311.03	3.78	3.98
HW-1	DMH-338	DMH-130	141	15	Concrete	0.01	432.60	428.35	437.93	437.93	4.08	3.98	0.030	11.21	5.27	47.00	9.00	433.53	4.40	4.63
EX OUTFALL-51	CBCI-145	EX DMH-608	48.30	12	Concrete	0.01	439.10	436.70	443.36	443.36	3.26	4.81	0.050	7.94	1.56	19.60	7.85	439.63	3.73	5.51
EX FES-7	EX DMH-641	EX FES-7	19	12	Concrete	0.01	266.90	266.50	272.65	272.65	4.75	N/A	0.021	5.18	1.74	33.50	5.94	267.46	5.19	N/A
EX OUTFALL-52	CBCI-170	DMH-352	22	12	Concrete	0.01	401.50	401.25	405.98	405.98	3.48	2.54	0.011	3.82	0.43	11.30	3.22	401.77	4.21	3.17
FES-3	EX DMH-669	DMH-374	165	12	Concrete	0.01	394.60	392.50	399.01	399.01	3.41	3.62	0.013	4.02	0.44	10.90	3.36	394.87	4.14	4.40
FES-5	CBCI-259	DMH-257	17	12	Concrete	0.01	318.70	318.60	323.05	323.05	3.35	3.52	0.006	2.77	0.61	21.80	2.83	319.43	3.62	3.69
FES-6	CBCI-360	CC-6	5	12	Concrete	0.01	280.65	280.60	285.18	285.18	3.53	N/A	0.011	3.77	0.57	15.00	3.46	280.96	4.22	N/A
FES-5	CBCI-377	DMH CIT-232	11	12	Concrete	0.01	267.90	267

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		CHECKED BY	WJS		DATE:										PAGE NO.				
	FOR ROUTE 16 MENDON	BACKCHECKED BY	DCS		DATE:														

Conduit Analysis

Network Outfall	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Material	Manning's n	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Slope (Calculated) (ft/ft)	Capacity (Design) (cfs)	Flow (cfs)	Flow / Capacity (Design) (%)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Depth to HGL (ft) In	Depth to HGL (ft) Out
EX OUTFALL-51	DMH-323	DMH-172	18	18	Concrete	0.01	389.50	389.10	394.91	394.91	3.91	4.02	0.022	15.52	14.87	95.80	8.41	392.19	2.72	2.81
EX OUTFALL-51	CB-154	DMH-379	43	15	Concrete	0.01	429.45	429.25	435.10	435.10	4.40	3.20	0.005	4.40	0.82	18.50	2.74	429.81	5.29	4.11
EX OUTFALL-51	DMH-379	DMH-380	13	15	Concrete	0.01	429.15	428.25	433.71	433.71	3.31	4.12	0.069	16.95	0.80	4.70	7.08	429.50	4.21	4.26
EX OUTFALL-51	DMH-380	EX DMH-671	31	15	Concrete	0.01	428.15	427.40	433.62	433.62	4.22	4.10	0.024	10.08	9.01	89.30	9.29	429.31	4.31	4.39
HW-1	DMH-142	DMH-138	0	12	Concrete	0.01	442.05	441.00	446.52	446.52	3.47	3.38	0.022	5.25	0.42	8.00	4.01	442.32	4.20	4.19
HW-1	CBCI-141	DMH-138	0	12	Concrete	0.01	443.20	441.00	447.49	447.49	3.29	3.38	0.029	6.06	0.26	4.20	3.83	443.41	4.08	4.17
FES-3	EX DMH-628	DMH-187	0	15	Concrete	0.01	383.50	382.70	388.32	388.32	3.57	4.47	0.023	9.73	0.75	7.70	4.69	383.84	4.48	5.22
EX FES-7	CBCI-221	DMH-315	0	12	Concrete	0.01	269.60	268.60	274.07	274.07	3.47	3.94	0.017	4.71	0.41	8.60	3.67	269.86	4.21	4.74
FES-5	CBCI-236	DMH CIT-233	0	12	Concrete	0.01	268.90	268.10	272.90	272.90	3.00	3.36	0.011	3.66	0.75	20.60	3.67	269.26	3.64	3.97
EX HW-646	EX CB-644	DMH-272	16	12	Concrete	0.01	355.80	354.82	362.81	362.81	6.01	3.62	0.063	8.92	0.72	8.10	6.83	356.15	6.66	4.17
EX HW-646	DMH-272	EX DMH-645	36	12	Concrete	0.01	354.82	352.50	359.44	359.44	3.62	5.74	0.064	9.02	1.04	11.60	7.66	355.25	4.19	5.32
EX HW-646	CB-273	DMH-272	0	12	Concrete	0.01	355.25	355.00	359.82	359.82	3.57	3.44	0.029	6.04	0.37	6.20	4.27	355.50	4.32	4.16
EX HW-646	DMH-274	EX DMH-645	0	15	Concrete	0.01	356.02	352.20	362.24	362.24	4.97	5.79	0.061	15.93	3.72	23.40	10.59	356.80	5.44	5.31
EX HW-646	EX DMH-645	EX HW-646	0	24	Concrete	0.01	352.10	351.90	359.24	359.24	5.14	N/A	0.006	18.10	4.53	25.00	4.79	353.91	5.33	N/A
EX DMH-658	CBCI-286	DMH-288	0	12	Concrete	0.01	373.95	371.00	378.22	378.22	3.27	4.11	0.027	5.82	0.34	5.90	4.06	374.19	4.03	4.96

Manning's n of 0.013 used for all concrete pipe.
All instances of shallow cover will be resolved at next submission.

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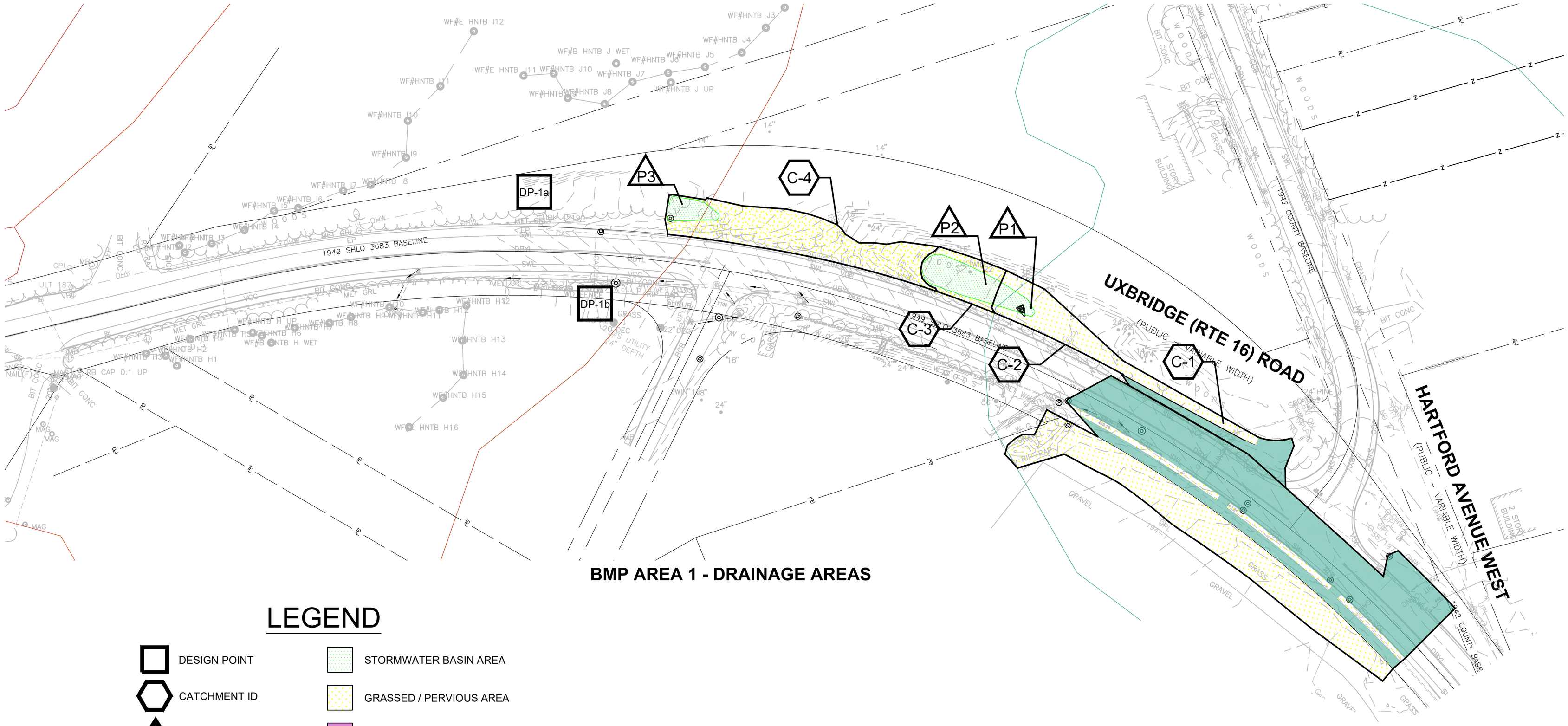
Appendix E

BMP Design Calculations
BMP Design HydroCAD
Recharge, Water Quality Volume, Drawdown Calculations
Grass Channel Calculations

Proposal No. 608491-131468

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BMP AREA 1 - DRAINAGE AREAS

LEGEND

- DESIGN POINT
- CATCHMENT ID
- PONDS
- CATCHMENT BOUNDARY
- STORMWATER BASIN AREA
- GRASSED / PERVIOUS AREA
- IMPERVIOUS AREA (HSG A)
- IMPERVIOUS AREA (HSG B)
- IMPERVIOUS AREA (HSG C)

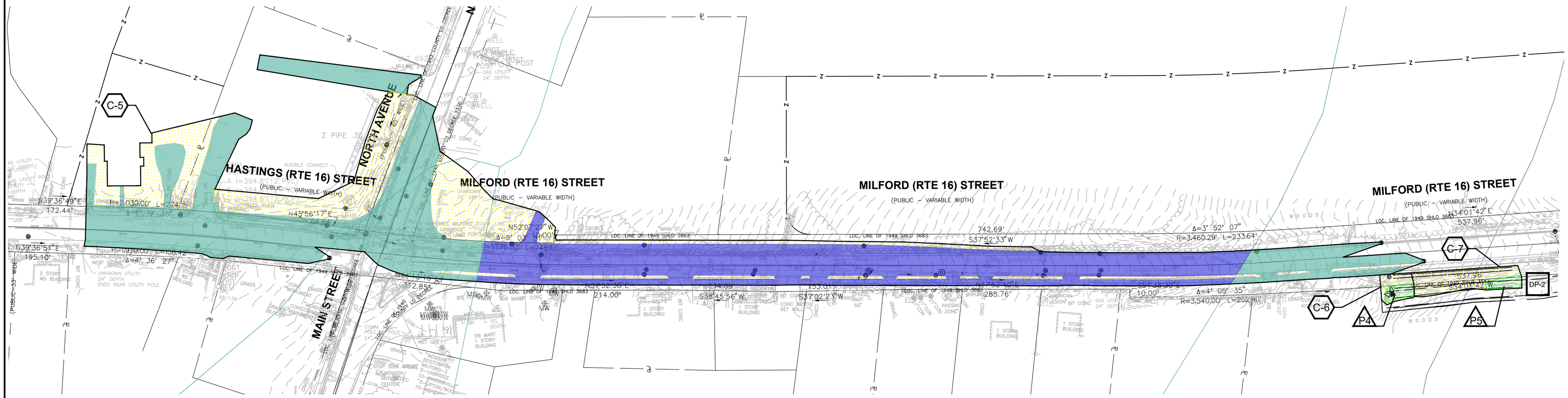
0 40 100 160

SCALE: 1" = 40'

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608491_UT(BMP CATCHMENT AREAS).DWG Plotted on 31-Jan-2024 1:52 PM

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BMP AREA 2 - DRAINAGE AREAS

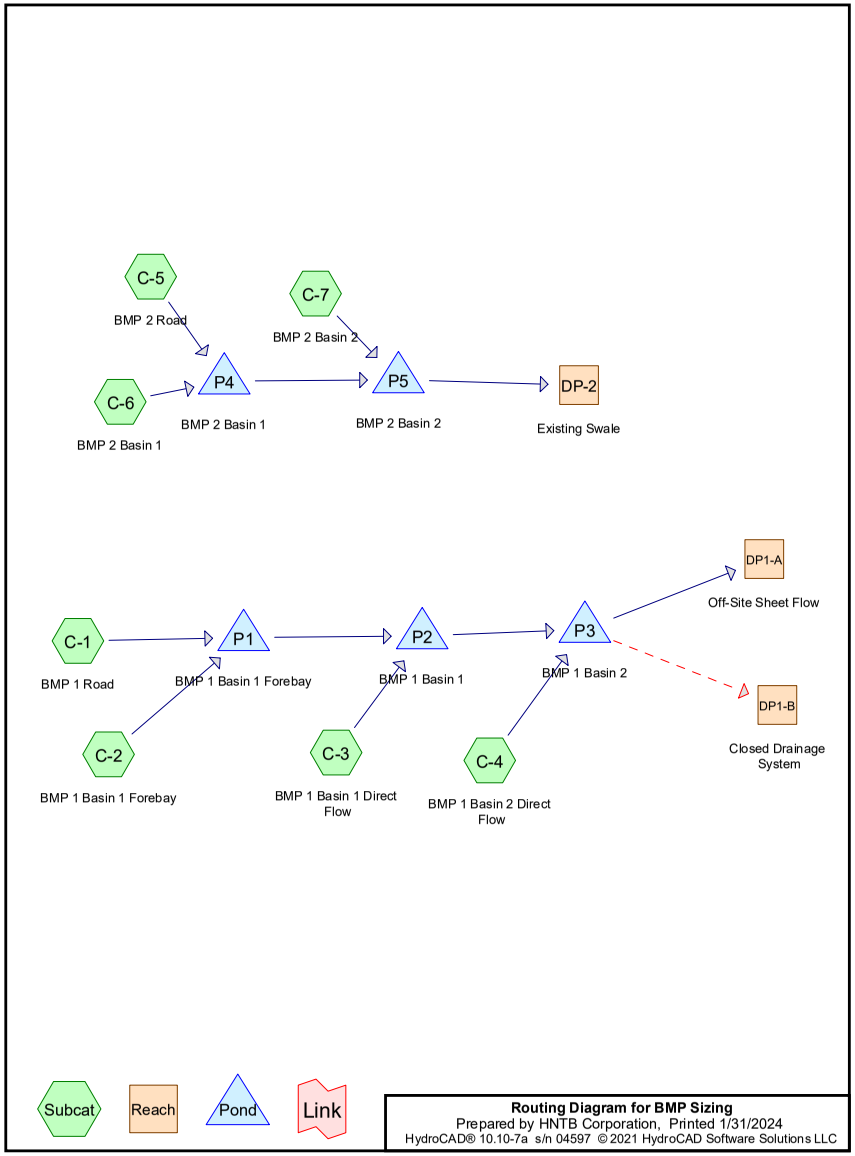
LEGEND

- DESIGN POINT
- CATCHMENT ID
- PONDS
- CATCHMENT BOUNDARY
- STORMWATER BASIN AREA
- GRASSED / PERVIOUS AREA
- IMPERVIOUS AREA (HSG A)
- IMPERVIOUS AREA (HSG B)
- IMPERVIOUS AREA (HSG C)

0 60 100 200 300

SCALE: 1" = 60'

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Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4244 MA Raynham Bristol County

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.37	2
2	10-year	Type III 24-hr		Default	24.00	1	5.21	2
3	100-year	Type III 24-hr		Default	24.00	1	8.14	2
4	WQV	Type III 24-hr		Default	24.00	1	1.00	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.208	61	>75% Grass cover, Good, HSG B (C-5)
1.182	74	>75% Grass cover, Good, HSG C (C-1, C-2, C-3, C-4, C-5, C-6, C-7)
0.085	98	Stormwater Basin (C-2, C-3, C-4, C-6, C-7)
1.009	98	Unconnected pavement, HSG B (C-5)
1.629	98	Unconnected pavement, HSG C (C-1, C-2, C-5)
4.113	**89**	**TOTAL AREA**

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
1.217	HSG B	C-5
2.811	HSG C	C-1, C-2, C-3, C-4, C-5, C-6, C-7
0.000	HSG D	
0.085	Other	C-2, C-3, C-4, C-6, C-7
4.113		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.208	1.182	0.000	0.000	1.390	>75% Grass cover, Good	C-1, C-2, C-3, C-4, C-5, C-6, C-7
0.000	0.000	0.000	0.000	0.085	0.085	Stormwater Basin	C-2, C-3, C-4, C-6, C-7
0.000	1.009	1.629	0.000	0.000	2.638	Unconnected pavement	C-1, C-2, C-5
0.000	**1.217**	**2.811**	**0.000**	**0.085**	**4.113**	**TOTAL AREA**	

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment C-1: BMP 1 Road Runoff Area=26,716 sf 60.54% Impervious Runoff Depth>2.10"
Tc=5.0 min CN=89 Runoff=1.60 cfs 0.107 af

Subcatchment C-2: BMP 1 Basin 1 Forebay Runoff Area=5,476 sf 36.61% Impervious Runoff Depth>1.63"
Tc=5.0 min CN=83 Runoff=0.26 cfs 0.017 af

Subcatchment C-3: BMP 1 Basin 1 Direct Runoff Area=2,130 sf 67.00% Impervious Runoff Depth>2.19"
Tc=5.0 min CN=90 Runoff=0.13 cfs 0.009 af

Subcatchment C-4: BMP 1 Basin 2 Direct Runoff Area=6,370 sf 9.69% Impervious Runoff Depth>1.17"
Tc=5.0 min CN=76 Runoff=0.21 cfs 0.014 af

Subcatchment C-5: BMP 2 Road Runoff Area=133,198 sf 72.97% Impervious Runoff Depth>2.28"
Tc=5.0 min CN=91 Runoff=8.55 cfs 0.581 af

Subcatchment C-6: BMP 2 Basin 1 Runoff Area=1,416 sf 44.00% Impervious Runoff Depth>1.78"
Tc=5.0 min CN=85 Runoff=0.07 cfs 0.005 af

Subcatchment C-7: BMP 2 Basin 2 Runoff Area=3,843 sf 14.60% Impervious Runoff Depth>1.29"
Tc=5.0 min CN=78 Runoff=0.14 cfs 0.009 af

Reach DP-2: Existing Swale Inflow=8.76 cfs 0.576 af
Outflow=8.76 cfs 0.576 af

Reach DP1-A: Off-Site Sheet Flow Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP1-B: Closed Drainage System Inflow=1.80 cfs 0.079 af
Outflow=1.80 cfs 0.079 af

Pond P1: BMP 1 Basin 1 Forebay Peak Elev=433.71' Storage=276 cf Inflow=1.85 cfs 0.125 af
Discarded=0.00 cfs 0.004 af Primary=1.85 cfs 0.115 af Outflow=1.86 cfs 0.119 af

Pond P2: BMP 1 Basin 1 Peak Elev=433.76' Storage=1,896 cf Inflow=1.98 cfs 0.124 af
Discarded=0.02 cfs 0.011 af Primary=1.59 cfs 0.075 af Outflow=1.61 cfs 0.087 af

Pond P3: BMP 1 Basin 2 Peak Elev=421.50' Storage=397 cf Inflow=1.74 cfs 0.090 af
Discarded=0.01 cfs 0.003 af Primary=0.00 cfs 0.000 af Secondary=1.80 cfs 0.079 af Outflow=1.81 cfs 0.082 af

Pond P4: BMP 2 Basin 1 Peak Elev=292.58' Storage=451 cf Inflow=8.62 cfs 0.586 af
Discarded=0.01 cfs 0.005 af Primary=8.59 cfs 0.575 af Outflow=8.59 cfs 0.580 af

Pond P5: BMP 2 Basin 2 Peak Elev=283.58' Storage=349 cf Inflow=8.73 cfs 0.584 af
Discarded=0.01 cfs 0.004 af Primary=8.76 cfs 0.576 af Outflow=8.76 cfs 0.580 af

Total Runoff Area = 4.113 ac Runoff Volume = 0.743 af Average Runoff Depth = 2.17"
33.80% Pervious = 1.390 ac 66.20% Impervious = 2.723 ac

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Summary for Subcatchment C-1: BMP 1 Road

[49] Hint: Tc<2dt may require smaller dt

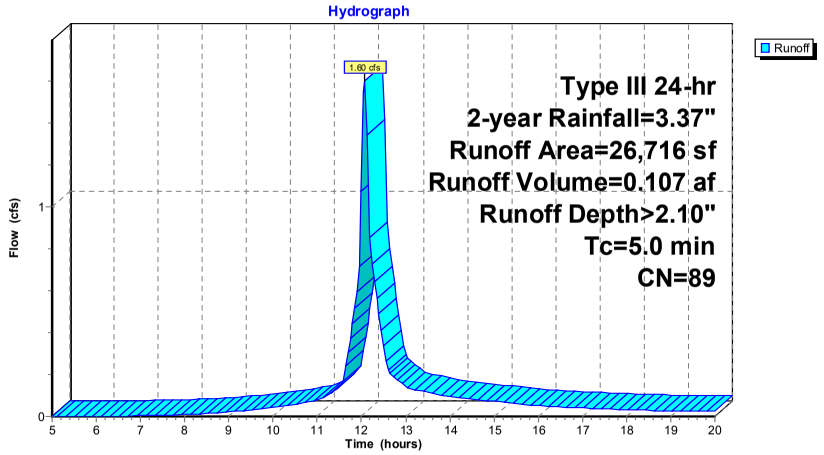
Runoff = 1.60 cfs @ 12.07 hrs, Volume= 0.107 af, Depth> 2.10"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

Area (sf)	CN	Description
10,542	74	>75% Grass cover, Good, HSG C
16,174	98	Unconnected pavement, HSG C
26,716	89	Weighted Average
10,542		39.46% Pervious Area
16,174		60.54% Impervious Area
16,174		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-1: BMP 1 Road



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Summary for Subcatchment C-2: BMP 1 Basin 1 Forebay

[49] Hint: Tc<2dt may require smaller dt

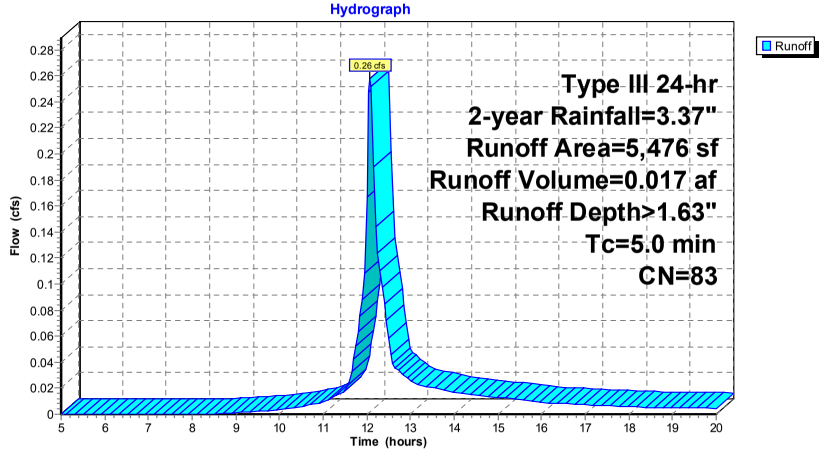
Runoff = 0.26 cfs @ 12.08 hrs, Volume= 0.017 af, Depth> 1.63"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Description
	3,471	74	>75% Grass cover, Good, HSG C
*	461	98	Stormwater Basin
	1,544	98	Unconnected pavement, HSG C
	5,476	83	Weighted Average
	3,471		63.39% Pervious Area
	2,005		36.61% Impervious Area
	1,544		77.01% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-2: BMP 1 Basin 1 Forebay



Summary for Subcatchment C-3: BMP 1 Basin 1 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

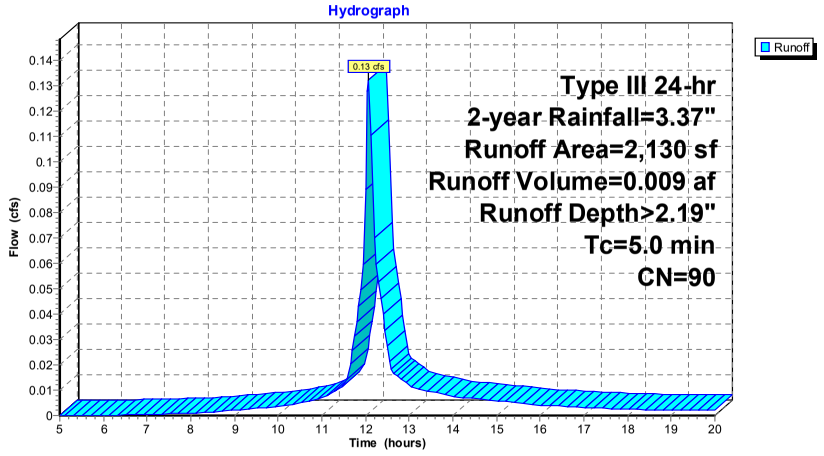
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af, Depth> 2.19"
Routed to Pond P2 : BMP 1 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Description
	703	74	>75% Grass cover, Good, HSG C
*	1,427	98	Stormwater Basin
	2,130	90	Weighted Average
	703		33.00% Pervious Area
	1,427		67.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-3: BMP 1 Basin 1 Direct Flow



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Summary for Subcatchment C-4: BMP 1 Basin 2 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

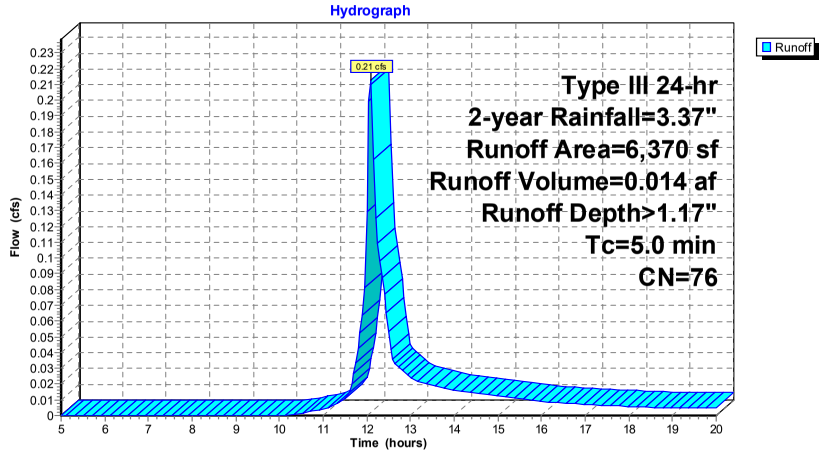
Runoff = 0.21 cfs @ 12.08 hrs, Volume= 0.014 af, Depth> 1.17"
Routed to Pond P3 : BMP 1 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Description
	5,753	74	>75% Grass cover, Good, HSG C
*	617	98	Stormwater Basin
	6,370	76	Weighted Average
	5,753		90.31% Pervious Area
	617		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-4: BMP 1 Basin 2 Direct Flow



Summary for Subcatchment C-5: BMP 2 Road

[49] Hint: Tc<2dt may require smaller dt

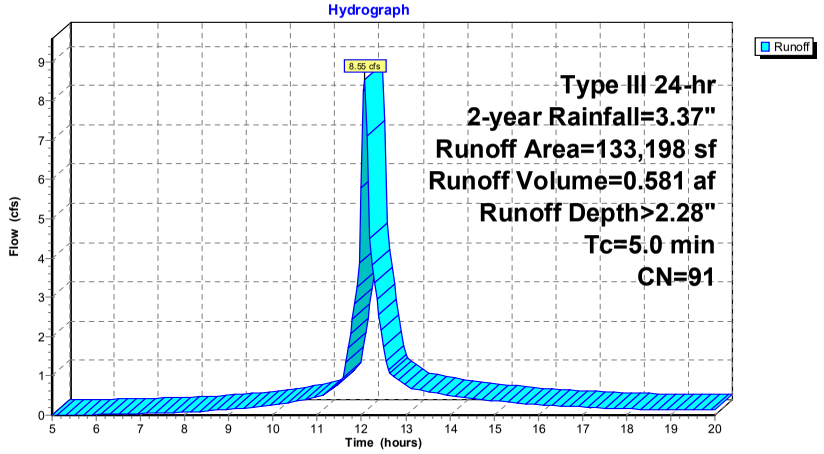
Runoff = 8.55 cfs @ 12.07 hrs, Volume= 0.581 af, Depth> 2.28"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

Area (sf)	CN	Description
26,950	74	>75% Grass cover, Good, HSG C
53,226	98	Unconnected pavement, HSG C
43,964	98	Unconnected pavement, HSG B
9,058	61	>75% Grass cover, Good, HSG B
133,198	91	Weighted Average
36,008		27.03% Pervious Area
97,190		72.97% Impervious Area
97,190		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-5: BMP 2 Road



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Summary for Subcatchment C-6: BMP 2 Basin 1

[49] Hint: Tc<2dt may require smaller dt

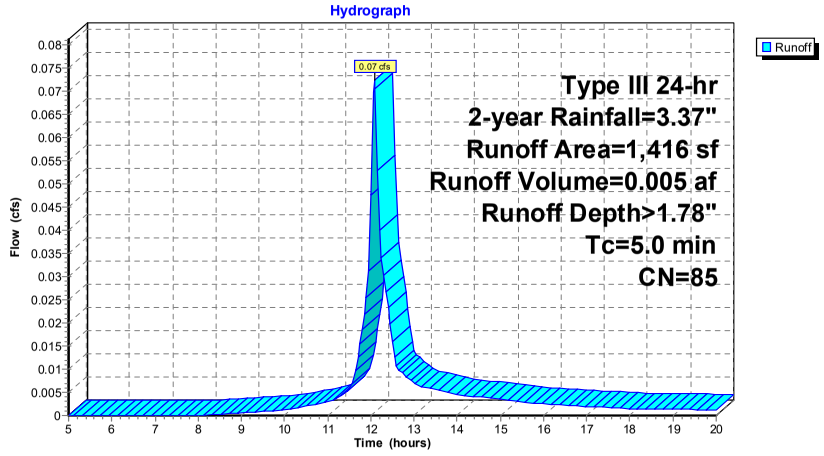
Runoff = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af, Depth> 1.78"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Description
	793	74	>75% Grass cover, Good, HSG C
*	623	98	Stormwater Basin
	1,416	85	Weighted Average
	793		56.00% Pervious Area
	623		44.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-6: BMP 2 Basin 1



Summary for Subcatchment C-7: BMP 2 Basin 2

[49] Hint: Tc<2dt may require smaller dt

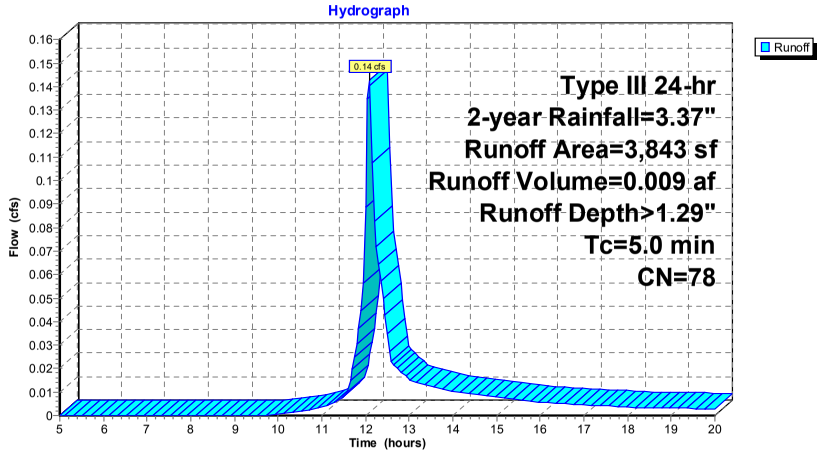
Runoff = 0.14 cfs @ 12.08 hrs, Volume= 0.009 af, Depth> 1.29"
Routed to Pond P5 : BMP 2 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.37"

	Area (sf)	CN	Description
	3,282	74	>75% Grass cover, Good, HSG C
*	561	98	Stormwater Basin
	3,843	78	Weighted Average
	3,282		85.40% Pervious Area
	561		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-7: BMP 2 Basin 2



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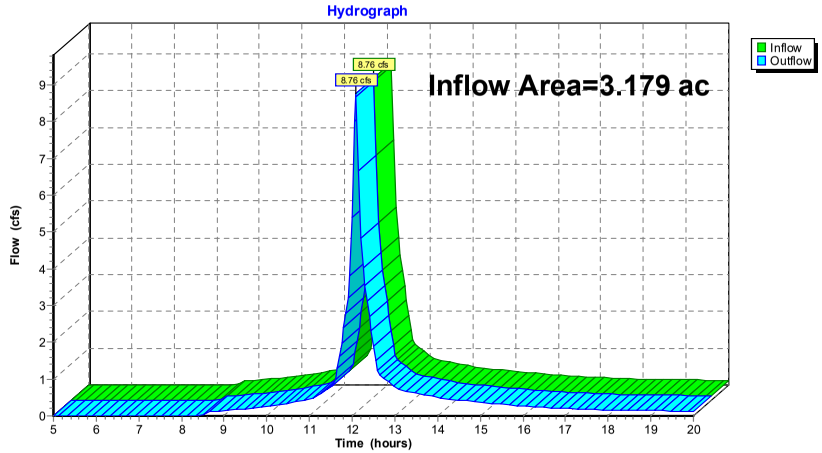
Summary for Reach DP-2: Existing Swale

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.179 ac, 71.05% Impervious, Inflow Depth > 2.18" for 2-year event
Inflow = 8.76 cfs @ 12.09 hrs, Volume= 0.576 af
Outflow = 8.76 cfs @ 12.09 hrs, Volume= 0.576 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Existing Swale



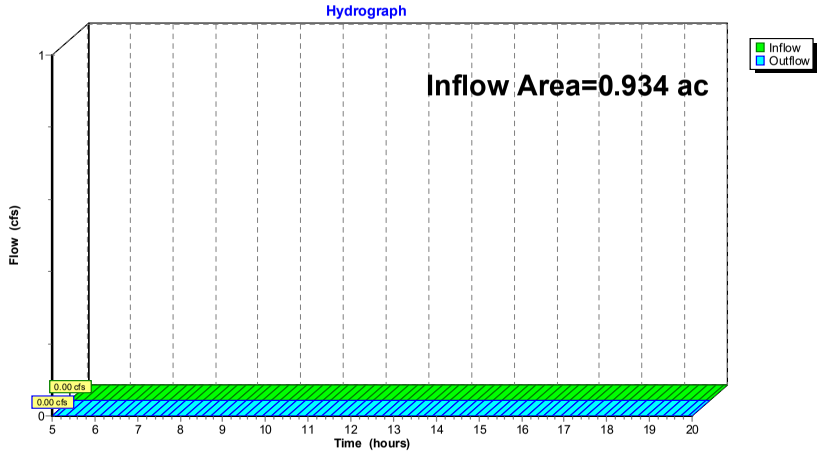
Summary for Reach DP1-A: Off-Site Sheet Flow

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.934 ac, 49.70% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-A: Off-Site Sheet Flow



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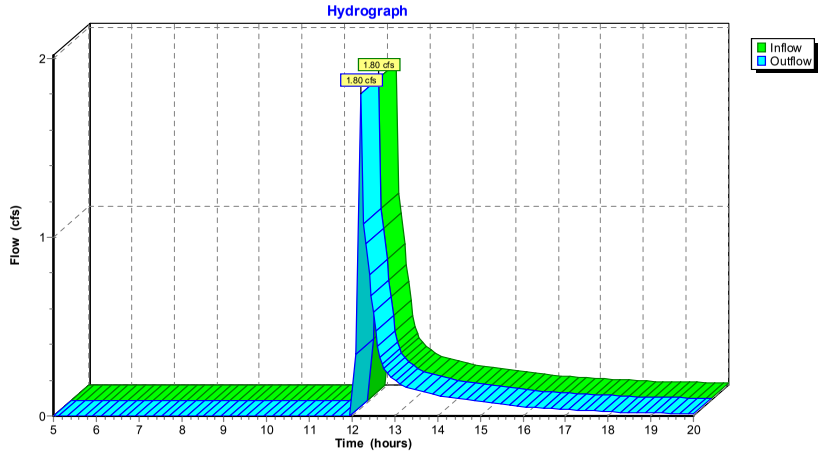
Summary for Reach DP1-B: Closed Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 1.80 cfs @ 12.20 hrs, Volume= 0.079 af
Outflow = 1.80 cfs @ 12.20 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-B: Closed Drainage System



Summary for Pond P1: BMP 1 Basin 1 Forebay

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.739 ac, 56.47% Impervious, Inflow Depth > 2.02" for 2-year event
Inflow = 1.85 cfs @ 12.08 hrs, Volume= 0.125 af
Outflow = 1.86 cfs @ 12.09 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.6 min
Discarded = 0.00 cfs @ 12.09 hrs, Volume= 0.004 af
Primary = 1.85 cfs @ 12.09 hrs, Volume= 0.115 af
Routed to Pond P2 : BMP 1 Basin 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.71' @ 12.09 hrs Surf.Area= 389 sf Storage= 276 cf

Plug-Flow detention time= 25.4 min calculated for 0.119 af (96% of inflow)
Center-of-Mass det. time= 10.1 min (788.1 - 778.0)

Volume	Invert	Avail.Storage	Storage Description
#1	432.50'	398 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
432.50	42	0	0
433.00	209	63	63
434.00	461	335	398

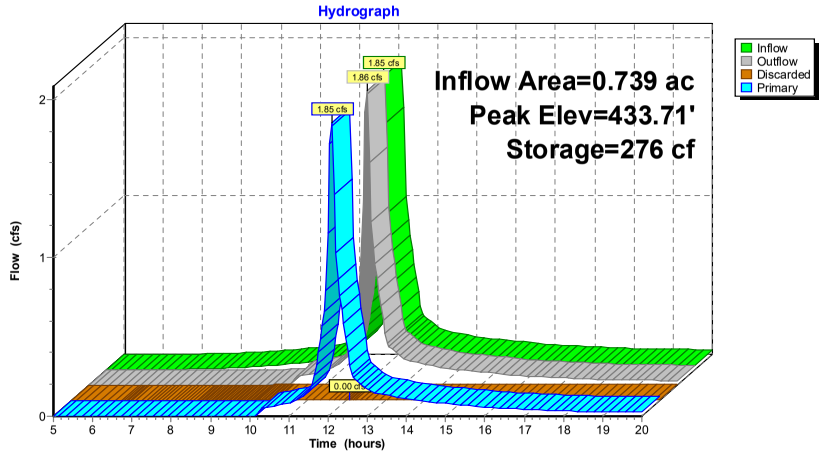
Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	432.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 12.09 hrs HW=433.71' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.80 cfs @ 12.09 hrs HW=433.71' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.80 cfs @ 0.94 fps)

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Pond P1: BMP 1 Basin 1 Forebay



Summary for Pond P2: BMP 1 Basin 1

[81] Warning: Exceeded Pond P1 by 0.07' @ 12.20 hrs

Inflow Area = 0.788 ac, 57.12% Impervious, Inflow Depth > 1.89" for 2-year event
Inflow = 1.98 cfs @ 12.08 hrs, Volume= 0.124 af
Outflow = 1.61 cfs @ 12.16 hrs, Volume= 0.087 af, Atten= 19%, Lag= 4.7 min
Discarded = 0.02 cfs @ 12.16 hrs, Volume= 0.011 af
Primary = 1.59 cfs @ 12.16 hrs, Volume= 0.075 af
Routed to Pond P3 : BMP 1 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.76' @ 12.16 hrs Surf.Area= 1,317 sf Storage= 1,896 cf

Plug-Flow detention time= 102.4 min calculated for 0.086 af (69% of inflow)
Center-of-Mass det. time= 40.4 min (825.4 - 785.0)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	2,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	416	0	0
432.00	586	251	251
433.00	974	780	1,031
434.00	1,427	1,201	2,231
434.50	1,594	755	2,986

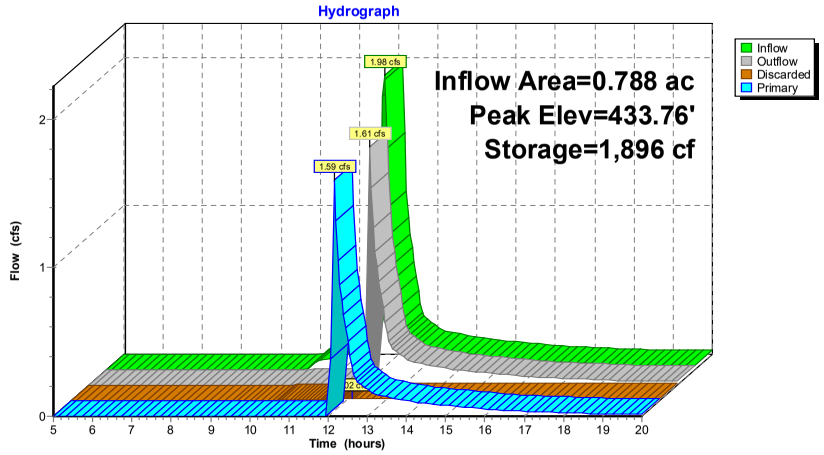
Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**7.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	431.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.16 hrs HW=433.75' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.49 cfs @ 12.16 hrs HW=433.75' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 1.49 cfs @ 1.08 fps)

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Pond P2: BMP 1 Basin 1



Summary for Pond P3: BMP 1 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.934 ac, 49.70% Impervious, Inflow Depth > 1.15" for 2-year event
Inflow = 1.74 cfs @ 12.16 hrs, Volume= 0.090 af
Outflow = 1.81 cfs @ 12.20 hrs, Volume= 0.082 af, Atten= 0%, Lag= 2.4 min
Discarded = 0.01 cfs @ 12.20 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Reach DP1-A : Off-Site Sheet Flow
Secondary = 1.80 cfs @ 12.20 hrs, Volume= 0.079 af
Routed to Reach DP1-B : Closed Drainage System

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 421.50' @ 12.20 hrs Surf.Area= 461 sf Storage= 397 cf

Plug-Flow detention time= 33.4 min calculated for 0.082 af (92% of inflow)
Center-of-Mass det. time= 9.1 min (820.3 - 811.1)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	1,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	103	0	0
421.00	308	206	206
422.00	616	462	668
422.50	726	336	1,003

Device	Routing	Invert	Outlet Devices
#1	Primary	421.50'	**8.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Secondary	421.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	420.00'	**0.520 in/hr Exfiltration over Surface area**

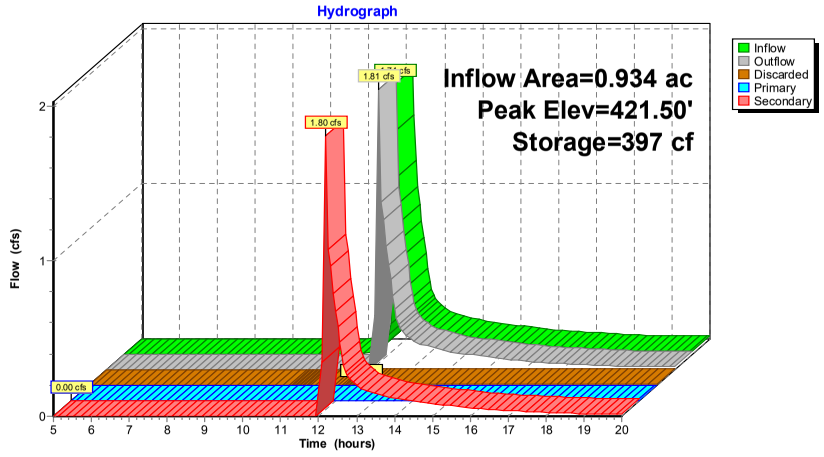
Discarded OutFlow Max=0.01 cfs @ 12.20 hrs HW=421.50' (Free Discharge)
↑└**3=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=420.00' (Free Discharge)
↑└**1=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Secondary OutFlow Max=1.79 cfs @ 12.20 hrs HW=421.50' (Free Discharge)
↑└**2=Orifice/Grate** (Weir Controls 1.79 cfs @ 1.45 fps)

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Pond P3: BMP 1 Basin 2



Summary for Pond P4: BMP 2 Basin 1

Inflow Area = 3.090 ac, 72.66% Impervious, Inflow Depth > 2.27" for 2-year event
Inflow = 8.62 cfs @ 12.07 hrs, Volume= 0.586 af
Outflow = 8.59 cfs @ 12.08 hrs, Volume= 0.580 af, Atten= 0%, Lag= 0.5 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 8.59 cfs @ 12.08 hrs, Volume= 0.575 af
Routed to Pond P5 : BMP 2 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 292.58' @ 12.08 hrs Surf.Area= 484 sf Storage= 451 cf

Plug-Flow detention time= 8.1 min calculated for 0.578 af (99% of inflow)
Center-of-Mass det. time= 4.0 min (772.5 - 768.5)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	1,012 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.00	110	0	0
292.00	325	218	218
293.00	600	463	680
293.50	729	332	1,012

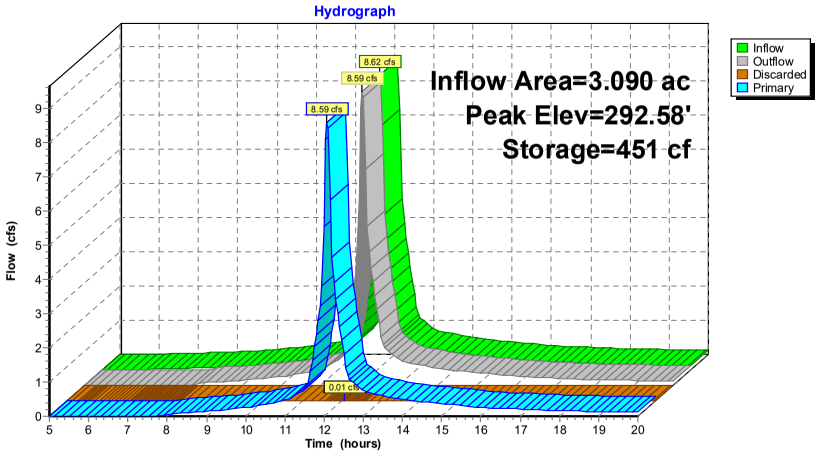
Device	Routing	Invert	Outlet Devices
#1	Primary	292.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	291.00'	**0.510 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=292.57' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=8.30 cfs @ 12.08 hrs HW=292.57' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 8.30 cfs @ 1.77 fps)

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Pond P4: BMP 2 Basin 1



Summary for Pond P5: BMP 2 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.179 ac, 71.05% Impervious, Inflow Depth > 2.21" for 2-year event
Inflow = 8.73 cfs @ 12.08 hrs, Volume= 0.584 af
Outflow = 8.76 cfs @ 12.09 hrs, Volume= 0.580 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.09 hrs, Volume= 0.004 af
Primary = 8.76 cfs @ 12.09 hrs, Volume= 0.576 af
Routed to Reach DP-2 : Existing Swale

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 283.58' @ 12.09 hrs Surf.Area= 438 sf Storage= 349 cf

Plug-Flow detention time= 5.3 min calculated for 0.580 af (99% of inflow)
Center-of-Mass det. time= 2.4 min (775.2 - 772.8)

Volume	Invert	Avail.Storage	Storage Description
#1	282.00'	867 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
282.00	25	0	0
283.00	263	144	144
284.00	563	413	557
284.50	675	310	867

Device	Routing	Invert	Outlet Devices
#1	Discarded	282.00'	**0.510 in/hr Exfiltration over Surface area**
#2	Primary	283.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

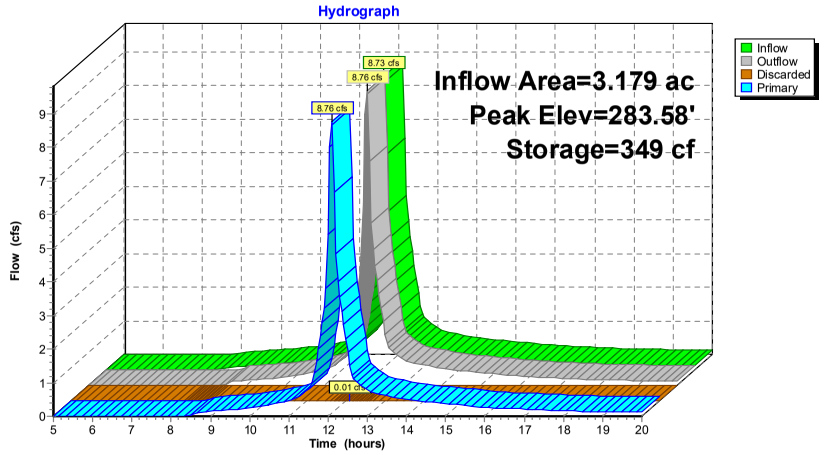
Discarded OutFlow Max=0.01 cfs @ 12.09 hrs HW=283.57' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=8.50 cfs @ 12.09 hrs HW=283.57' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 8.50 cfs @ 1.79 fps)

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Pond P5: BMP 2 Basin 2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentC-1: BMP 1 Road Runoff Area=26,716 sf 60.54% Impervious Runoff Depth>3.75"
Tc=5.0 min CN=89 Runoff=2.78 cfs 0.192 af

SubcatchmentC-2: BMP 1 Basin 1 Forebay Runoff Area=5,476 sf 36.61% Impervious Runoff Depth>3.16"
Tc=5.0 min CN=83 Runoff=0.50 cfs 0.033 af

SubcatchmentC-3: BMP 1 Basin 1 Direct Runoff Area=2,130 sf 67.00% Impervious Runoff Depth>3.86"
Tc=5.0 min CN=90 Runoff=0.23 cfs 0.016 af

SubcatchmentC-4: BMP 1 Basin 2 Direct Runoff Area=6,370 sf 9.69% Impervious Runoff Depth>2.52"
Tc=5.0 min CN=76 Runoff=0.46 cfs 0.031 af

SubcatchmentC-5: BMP 2 Road Runoff Area=133,198 sf 72.97% Impervious Runoff Depth>3.96"
Tc=5.0 min CN=91 Runoff=14.41 cfs 1.008 af

SubcatchmentC-6: BMP 2 Basin 1 Runoff Area=1,416 sf 44.00% Impervious Runoff Depth>3.35"
Tc=5.0 min CN=85 Runoff=0.13 cfs 0.009 af

SubcatchmentC-7: BMP 2 Basin 2 Runoff Area=3,843 sf 14.60% Impervious Runoff Depth>2.70"
Tc=5.0 min CN=78 Runoff=0.30 cfs 0.020 af

Reach DP-2: Existing Swale Inflow=14.80 cfs 1.017 af
Outflow=14.80 cfs 1.017 af

Reach DP1-A: Off-Site Sheet Flow Inflow=0.55 cfs 0.006 af
Outflow=0.55 cfs 0.006 af

Reach DP1-B: Closed Drainage System Inflow=3.24 cfs 0.194 af
Outflow=3.24 cfs 0.194 af

Pond P1: BMP 1 Basin 1 Forebay Peak Elev=433.79' Storage=305 cf Inflow=3.28 cfs 0.225 af
Discarded=0.00 cfs 0.005 af Primary=3.26 cfs 0.215 af Outflow=3.27 cfs 0.220 af

Pond P2: BMP 1 Basin 1 Peak Elev=433.88' Storage=2,063 cf Inflow=3.48 cfs 0.231 af
Discarded=0.02 cfs 0.013 af Primary=3.35 cfs 0.180 af Outflow=3.37 cfs 0.193 af

Pond P3: BMP 1 Basin 2 Peak Elev=421.59' Storage=442 cf Inflow=3.80 cfs 0.211 af
Discarded=0.01 cfs 0.004 af Primary=0.55 cfs 0.006 af Secondary=3.24 cfs 0.194 af Outflow=3.80 cfs 0.204 af

Pond P4: BMP 2 Basin 1 Peak Elev=292.76' Storage=545 cf Inflow=14.55 cfs 1.018 af
Discarded=0.01 cfs 0.005 af Primary=14.46 cfs 1.006 af Outflow=14.47 cfs 1.011 af

Pond P5: BMP 2 Basin 2 Peak Elev=283.77' Storage=436 cf Inflow=14.76 cfs 1.026 af
Discarded=0.01 cfs 0.004 af Primary=14.80 cfs 1.017 af Outflow=14.80 cfs 1.022 af

Total Runoff Area = 4.113 ac Runoff Volume = 1.309 af Average Runoff Depth = 3.82"
33.80% Pervious = 1.390 ac 66.20% Impervious = 2.723 ac

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Summary for Subcatchment C-1: BMP 1 Road

[49] Hint: Tc<2dt may require smaller dt

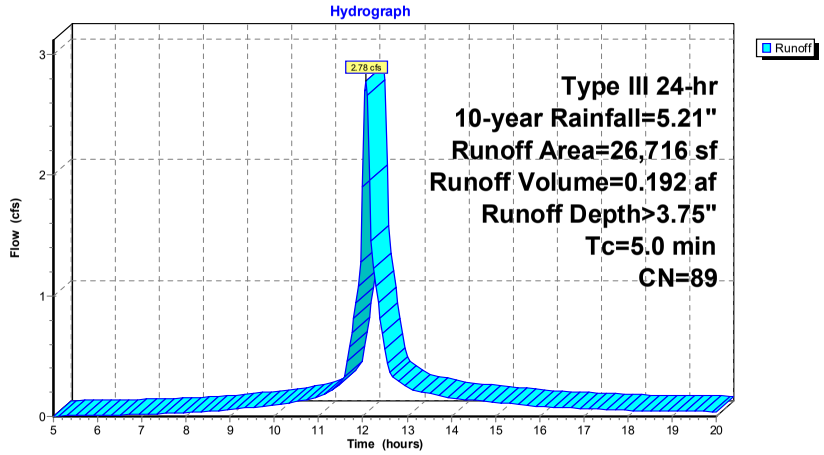
Runoff = 2.78 cfs @ 12.07 hrs, Volume= 0.192 af, Depth> 3.75"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

Area (sf)	CN	Description
10,542	74	>75% Grass cover, Good, HSG C
16,174	98	Unconnected pavement, HSG C
26,716	89	Weighted Average
10,542		39.46% Pervious Area
16,174		60.54% Impervious Area
16,174		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-1: BMP 1 Road



Summary for Subcatchment C-2: BMP 1 Basin 1 Forebay

[49] Hint: Tc<2dt may require smaller dt

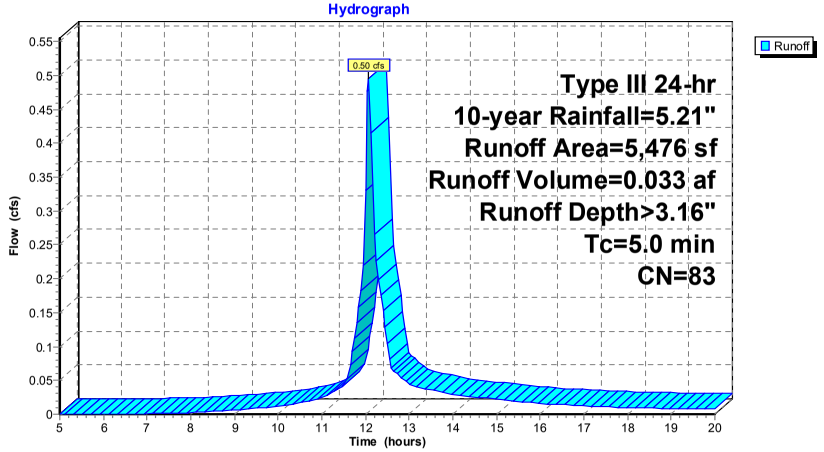
Runoff = 0.50 cfs @ 12.07 hrs, Volume= 0.033 af, Depth> 3.16"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Description
	3,471	74	>75% Grass cover, Good, HSG C
*	461	98	Stormwater Basin
	1,544	98	Unconnected pavement, HSG C
	5,476	83	Weighted Average
	3,471		63.39% Pervious Area
	2,005		36.61% Impervious Area
	1,544		77.01% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-2: BMP 1 Basin 1 Forebay



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Summary for Subcatchment C-3: BMP 1 Basin 1 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

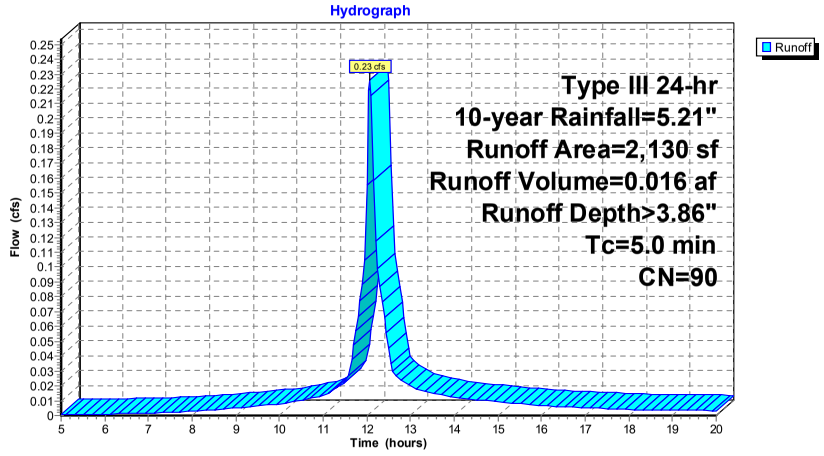
Runoff = 0.23 cfs @ 12.07 hrs, Volume= 0.016 af, Depth> 3.86"
Routed to Pond P2 : BMP 1 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Description
	703	74	>75% Grass cover, Good, HSG C
*	1,427	98	Stormwater Basin
	2,130	90	Weighted Average
	703		33.00% Pervious Area
	1,427		67.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-3: BMP 1 Basin 1 Direct Flow



Summary for Subcatchment C-4: BMP 1 Basin 2 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

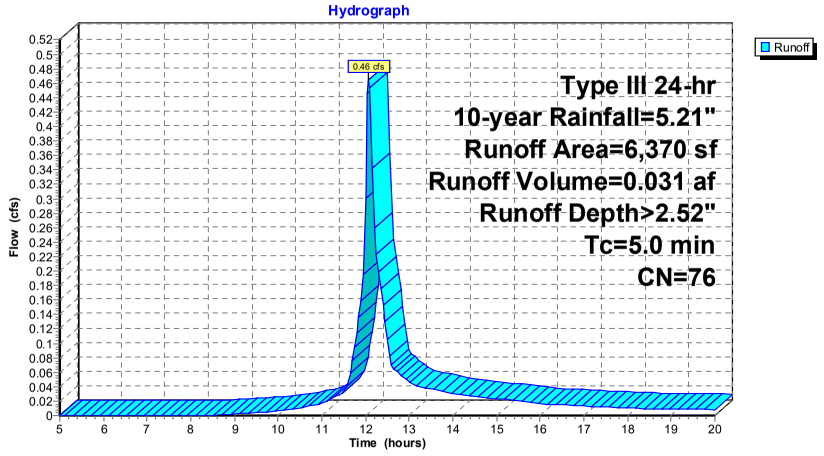
Runoff = 0.46 cfs @ 12.08 hrs, Volume= 0.031 af, Depth> 2.52"
Routed to Pond P3 : BMP 1 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Description
	5,753	74	>75% Grass cover, Good, HSG C
*	617	98	Stormwater Basin
	6,370	76	Weighted Average
	5,753		90.31% Pervious Area
	617		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-4: BMP 1 Basin 2 Direct Flow



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Summary for Subcatchment C-5: BMP 2 Road

[49] Hint: Tc<2dt may require smaller dt

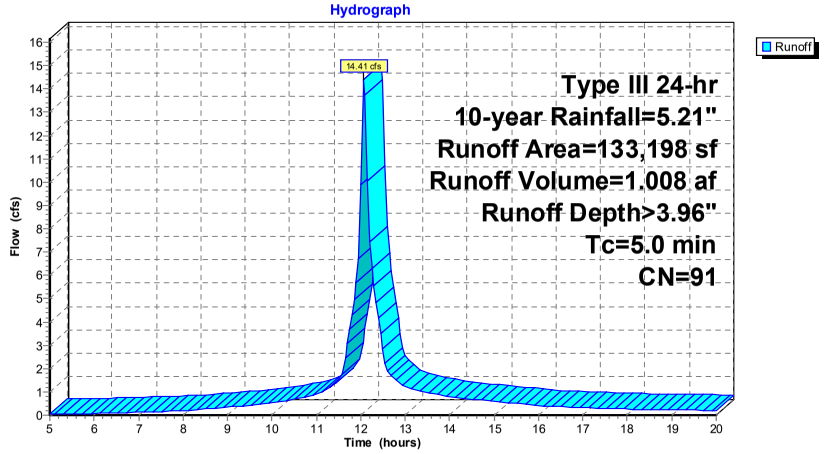
Runoff = 14.41 cfs @ 12.07 hrs, Volume= 1.008 af, Depth> 3.96"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

Area (sf)	CN	Description
26,950	74	>75% Grass cover, Good, HSG C
53,226	98	Unconnected pavement, HSG C
43,964	98	Unconnected pavement, HSG B
9,058	61	>75% Grass cover, Good, HSG B
133,198	91	Weighted Average
36,008		27.03% Pervious Area
97,190		72.97% Impervious Area
97,190		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-5: BMP 2 Road



Summary for Subcatchment C-6: BMP 2 Basin 1

[49] Hint: Tc<2dt may require smaller dt

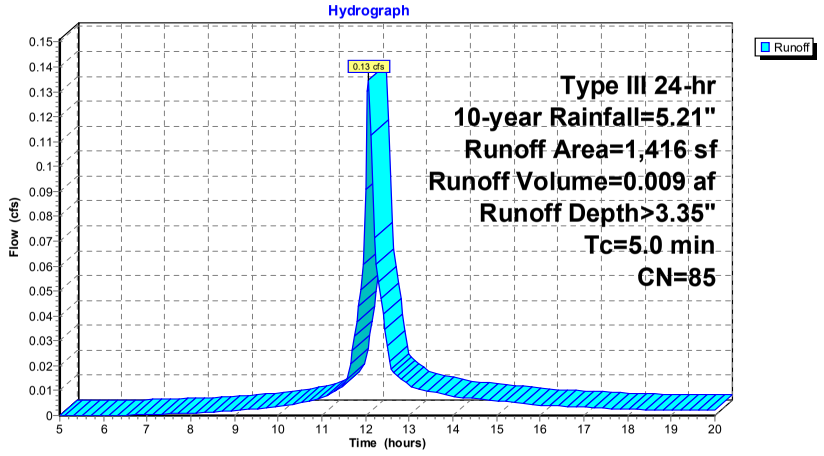
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af, Depth> 3.35"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Description
	793	74	>75% Grass cover, Good, HSG C
*	623	98	Stormwater Basin
	1,416	85	Weighted Average
	793		56.00% Pervious Area
	623		44.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-6: BMP 2 Basin 1



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Summary for Subcatchment C-7: BMP 2 Basin 2

[49] Hint: Tc<2dt may require smaller dt

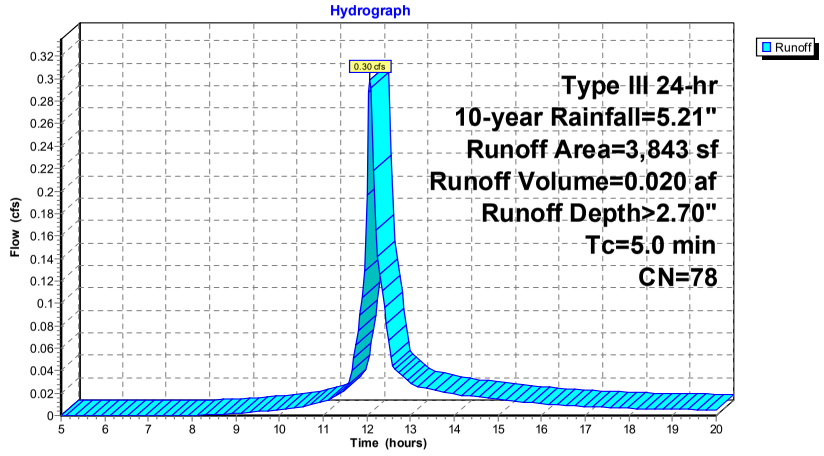
Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.020 af, Depth> 2.70"
Routed to Pond P5 : BMP 2 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.21"

	Area (sf)	CN	Description
	3,282	74	>75% Grass cover, Good, HSG C
*	561	98	Stormwater Basin
	3,843	78	Weighted Average
	3,282		85.40% Pervious Area
	561		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-7: BMP 2 Basin 2



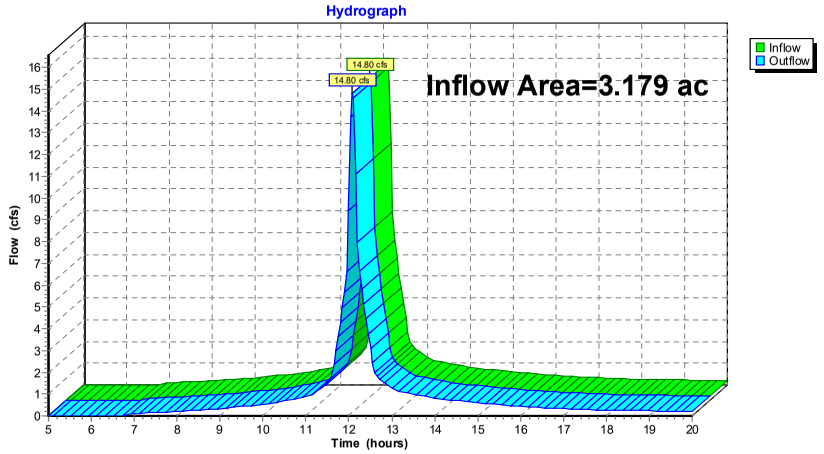
Summary for Reach DP-2: Existing Swale

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.179 ac, 71.05% Impervious, Inflow Depth > 3.84" for 10-year event
Inflow = 14.80 cfs @ 12.08 hrs, Volume= 1.017 af
Outflow = 14.80 cfs @ 12.08 hrs, Volume= 1.017 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Existing Swale



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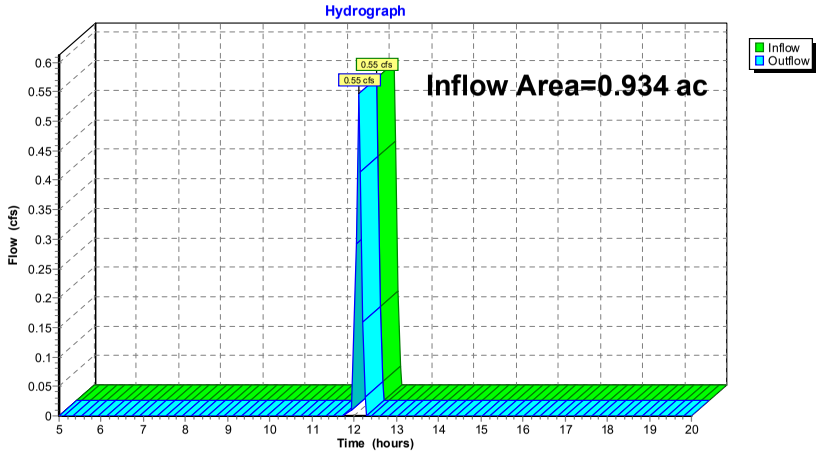
Summary for Reach DP1-A: Off-Site Sheet Flow

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.934 ac, 49.70% Impervious, Inflow Depth = 0.08" for 10-year event
Inflow = 0.55 cfs @ 12.11 hrs, Volume= 0.006 af
Outflow = 0.55 cfs @ 12.11 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-A: Off-Site Sheet Flow



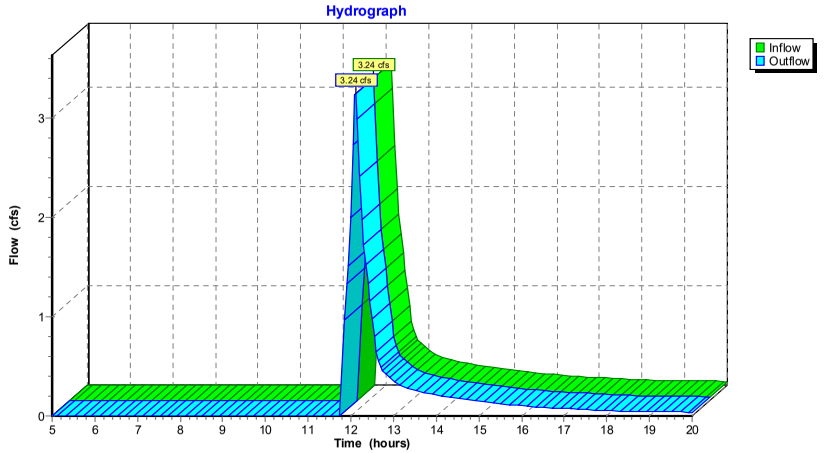
Summary for Reach DP1-B: Closed Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 3.24 cfs @ 12.11 hrs, Volume= 0.194 af
Outflow = 3.24 cfs @ 12.11 hrs, Volume= 0.194 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-B: Closed Drainage System



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Summary for Pond P1: BMP 1 Basin 1 Forebay

Inflow Area = 0.739 ac, 56.47% Impervious, Inflow Depth > 3.65" for 10-year event
Inflow = 3.28 cfs @ 12.07 hrs, Volume= 0.225 af
Outflow = 3.27 cfs @ 12.08 hrs, Volume= 0.220 af, Atten= 0%, Lag= 0.5 min
Discarded = 0.00 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 3.26 cfs @ 12.08 hrs, Volume= 0.215 af
Routed to Pond P2 : BMP 1 Basin 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.79' @ 12.08 hrs Surf.Area= 407 sf Storage= 305 cf

Plug-Flow detention time= 17.0 min calculated for 0.220 af (98% of inflow)
Center-of-Mass det. time= 7.8 min (772.0 - 764.2)

Volume	Invert	Avail.Storage	Storage Description
#1	432.50'	398 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

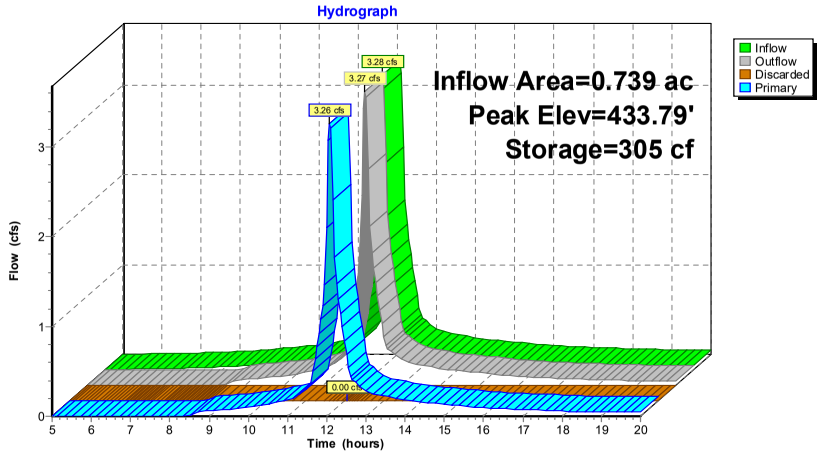
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
432.50	42	0	0
433.00	209	63	63
434.00	461	335	398

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	432.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 12.08 hrs HW=433.78' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=3.15 cfs @ 12.08 hrs HW=433.78' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 3.15 cfs @ 1.14 fps)

Pond P1: BMP 1 Basin 1 Forebay



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Summary for Pond P2: BMP 1 Basin 1

[81] Warning: Exceeded Pond P1 by 0.11' @ 12.15 hrs

Inflow Area = 0.788 ac, 57.12% Impervious, Inflow Depth > 3.52" for 10-year event
Inflow = 3.48 cfs @ 12.08 hrs, Volume= 0.231 af
Outflow = 3.37 cfs @ 12.11 hrs, Volume= 0.193 af, Atten= 3%, Lag= 1.5 min
Discarded = 0.02 cfs @ 12.11 hrs, Volume= 0.013 af
Primary = 3.35 cfs @ 12.11 hrs, Volume= 0.180 af
Routed to Pond P3 : BMP 1 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.88' @ 12.11 hrs Surf.Area= 1,372 sf Storage= 2,063 cf

Plug-Flow detention time= 72.5 min calculated for 0.192 af (83% of inflow)
Center-of-Mass det. time= 27.9 min (798.5 - 770.6)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	2,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

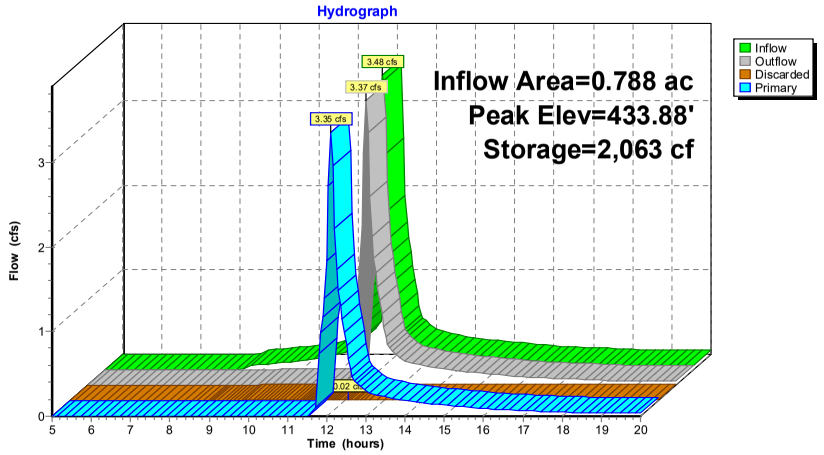
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	416	0	0
432.00	586	251	251
433.00	974	780	1,031
434.00	1,427	1,201	2,231
434.50	1,594	755	2,986

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**7.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	431.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.11 hrs HW=433.88' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=3.30 cfs @ 12.11 hrs HW=433.88' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 3.30 cfs @ 1.44 fps)

Pond P2: BMP 1 Basin 1



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Summary for Pond P3: BMP 1 Basin 2

Inflow Area = 0.934 ac, 49.70% Impervious, Inflow Depth > 2.71" for 10-year event
Inflow = 3.80 cfs @ 12.10 hrs, Volume= 0.211 af
Outflow = 3.80 cfs @ 12.11 hrs, Volume= 0.204 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.004 af
Primary = 0.55 cfs @ 12.11 hrs, Volume= 0.006 af
Routed to Reach DP1-A : Off-Site Sheet Flow
Secondary = 3.24 cfs @ 12.11 hrs, Volume= 0.194 af
Routed to Reach DP1-B : Closed Drainage System

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 421.59' @ 12.11 hrs Surf.Area= 490 sf Storage= 442 cf

Plug-Flow detention time= 16.7 min calculated for 0.203 af (96% of inflow)
Center-of-Mass det. time= 4.5 min (797.3 - 792.8)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	1,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	103	0	0
421.00	308	206	206
422.00	616	462	668
422.50	726	336	1,003

Device	Routing	Invert	Outlet Devices
#1	Primary	421.50'	**8.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Secondary	421.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	420.00'	**0.520 in/hr Exfiltration over Surface area**

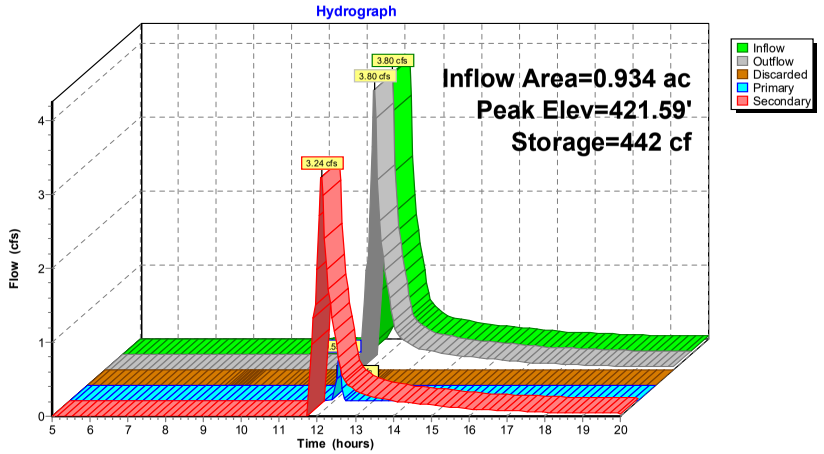
Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=421.59' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.52 cfs @ 12.11 hrs HW=421.59' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 0.73 fps)

Secondary OutFlow Max=3.19 cfs @ 12.11 hrs HW=421.59' (Free Discharge)
↑**2=Orifice/Grate** (Weir Controls 3.19 cfs @ 1.76 fps)

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Pond P3: BMP 1 Basin 2



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Summary for Pond P4: BMP 2 Basin 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 3.090 ac, 72.66% Impervious, Inflow Depth > 3.95" for 10-year event
Inflow = 14.55 cfs @ 12.07 hrs, Volume= 1.018 af
Outflow = 14.47 cfs @ 12.08 hrs, Volume= 1.011 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 14.46 cfs @ 12.08 hrs, Volume= 1.006 af
Routed to Pond P5 : BMP 2 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 292.76' @ 12.08 hrs Surf.Area= 534 sf Storage= 545 cf

Plug-Flow detention time= 5.4 min calculated for 1.008 af (99% of inflow)
Center-of-Mass det. time= 2.9 min (759.0 - 756.1)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	1,012 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.00	110	0	0
292.00	325	218	218
293.00	600	463	680
293.50	729	332	1,012

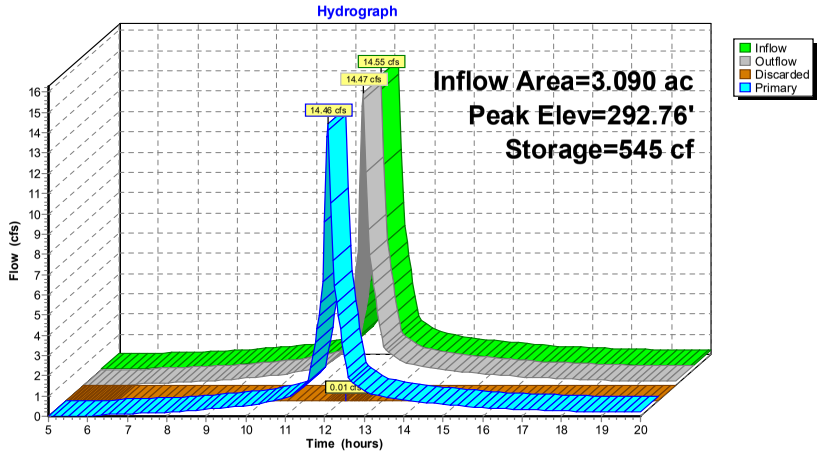
Device	Routing	Invert	Outlet Devices
#1	Primary	292.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	291.00'	**0.510 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=292.75' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=13.98 cfs @ 12.08 hrs HW=292.75' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 13.98 cfs @ 2.16 fps)

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Pond P4: BMP 2 Basin 1



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Summary for Pond P5: BMP 2 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.179 ac, 71.05% Impervious, Inflow Depth > 3.87" for 10-year event
Inflow = 14.76 cfs @ 12.08 hrs, Volume= 1.026 af
Outflow = 14.80 cfs @ 12.08 hrs, Volume= 1.022 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.004 af
Primary = 14.80 cfs @ 12.08 hrs, Volume= 1.017 af
Routed to Reach DP-2 : Existing Swale

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 283.77' @ 12.08 hrs Surf.Area= 495 sf Storage= 436 cf

Plug-Flow detention time= 3.6 min calculated for 1.018 af (99% of inflow)
Center-of-Mass det. time= 1.8 min (761.4 - 759.5)

Volume	Invert	Avail.Storage	Storage Description
#1	282.00'	867 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

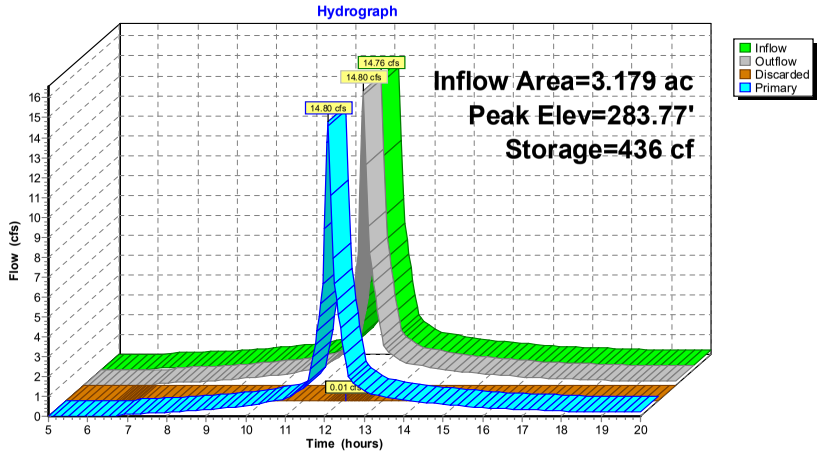
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
282.00	25	0	0
283.00	263	144	144
284.00	563	413	557
284.50	675	310	867

Device	Routing	Invert	Outlet Devices
#1	Discarded	282.00'	**0.510 in/hr Exfiltration over Surface area**
#2	Primary	283.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=283.76' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=14.33 cfs @ 12.08 hrs HW=283.76' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 14.33 cfs @ 2.18 fps)

Pond P5: BMP 2 Basin 2



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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment C-1: BMP 1 Road Runoff Area=26,716 sf 60.54% Impervious Runoff Depth>6.45"
Tc=5.0 min CN=89 Runoff=4.64 cfs 0.329 af

Subcatchment C-2: BMP 1 Basin 1 Forebay Runoff Area=5,476 sf 36.61% Impervious Runoff Depth>5.77"
Tc=5.0 min CN=83 Runoff=0.88 cfs 0.060 af

Subcatchment C-3: BMP 1 Basin 1 Direct Runoff Area=2,130 sf 67.00% Impervious Runoff Depth>6.55"
Tc=5.0 min CN=90 Runoff=0.37 cfs 0.027 af

Subcatchment C-4: BMP 1 Basin 2 Direct Runoff Area=6,370 sf 9.69% Impervious Runoff Depth>4.96"
Tc=5.0 min CN=76 Runoff=0.91 cfs 0.060 af

Subcatchment C-5: BMP 2 Road Runoff Area=133,198 sf 72.97% Impervious Runoff Depth>6.66"
Tc=5.0 min CN=91 Runoff=23.61 cfs 1.697 af

Subcatchment C-6: BMP 2 Basin 1 Runoff Area=1,416 sf 44.00% Impervious Runoff Depth>6.00"
Tc=5.0 min CN=85 Runoff=0.23 cfs 0.016 af

Subcatchment C-7: BMP 2 Basin 2 Runoff Area=3,843 sf 14.60% Impervious Runoff Depth>5.19"
Tc=5.0 min CN=78 Runoff=0.57 cfs 0.038 af

Reach DP-2: Existing Swale Inflow=24.34 cfs 1.731 af
Outflow=24.34 cfs 1.731 af

Reach DP1-A: Off-Site Sheet Flow Inflow=1.60 cfs 0.027 af
Outflow=1.60 cfs 0.027 af

Reach DP1-B: Closed Drainage System Inflow=4.98 cfs 0.375 af
Outflow=4.98 cfs 0.375 af

Pond P1: BMP 1 Basin 1 Forebay Peak Elev=433.88' Storage=343 cf Inflow=5.52 cfs 0.390 af
Discarded=0.01 cfs 0.005 af Primary=5.49 cfs 0.380 af Outflow=5.49 cfs 0.385 af

Pond P2: BMP 1 Basin 1 Peak Elev=434.01' Storage=2,246 cf Inflow=5.86 cfs 0.406 af
Discarded=0.02 cfs 0.015 af Primary=5.72 cfs 0.353 af Outflow=5.73 cfs 0.368 af

Pond P3: BMP 1 Basin 2 Peak Elev=421.69' Storage=491 cf Inflow=6.59 cfs 0.414 af
Discarded=0.01 cfs 0.005 af Primary=1.60 cfs 0.027 af Secondary=4.98 cfs 0.375 af Outflow=6.59 cfs 0.406 af

Pond P4: BMP 2 Basin 1 Peak Elev=293.02' Storage=694 cf Inflow=23.84 cfs 1.713 af
Discarded=0.01 cfs 0.006 af Primary=23.69 cfs 1.702 af Outflow=23.70 cfs 1.707 af

Pond P5: BMP 2 Basin 2 Peak Elev=284.04' Storage=580 cf Inflow=24.26 cfs 1.740 af
Discarded=0.01 cfs 0.005 af Primary=24.34 cfs 1.731 af Outflow=24.34 cfs 1.735 af

Total Runoff Area = 4.113 ac Runoff Volume = 2.229 af Average Runoff Depth = 6.50"
33.80% Pervious = 1.390 ac 66.20% Impervious = 2.723 ac

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Summary for Subcatchment C-1: BMP 1 Road

[49] Hint: Tc<2dt may require smaller dt

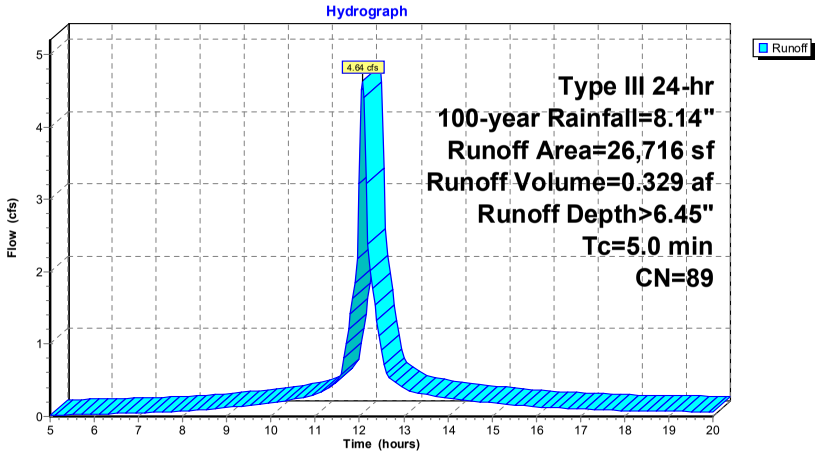
Runoff = 4.64 cfs @ 12.07 hrs, Volume= 0.329 af, Depth> 6.45"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

Area (sf)	CN	Description
10,542	74	>75% Grass cover, Good, HSG C
16,174	98	Unconnected pavement, HSG C
26,716	89	Weighted Average
10,542		39.46% Pervious Area
16,174		60.54% Impervious Area
16,174		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-1: BMP 1 Road



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Summary for Subcatchment C-2: BMP 1 Basin 1 Forebay

[49] Hint: Tc<2dt may require smaller dt

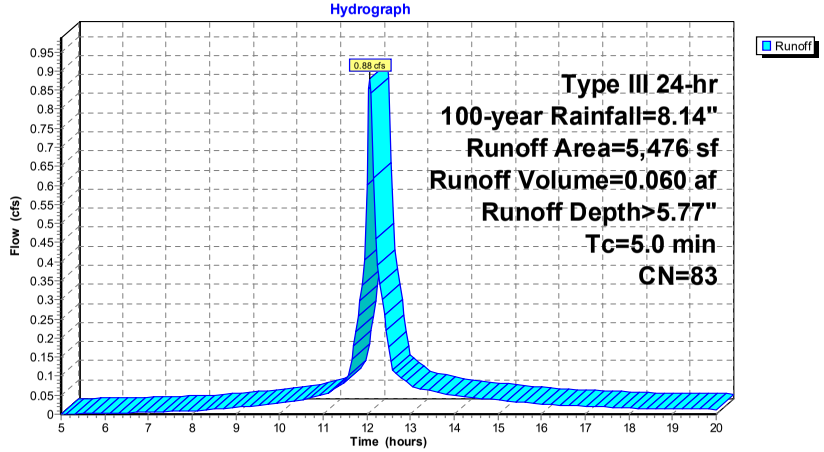
Runoff = 0.88 cfs @ 12.07 hrs, Volume= 0.060 af, Depth> 5.77"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Description
	3,471	74	>75% Grass cover, Good, HSG C
*	461	98	Stormwater Basin
	1,544	98	Unconnected pavement, HSG C
	5,476	83	Weighted Average
	3,471		63.39% Pervious Area
	2,005		36.61% Impervious Area
	1,544		77.01% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-2: BMP 1 Basin 1 Forebay



Summary for Subcatchment C-3: BMP 1 Basin 1 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

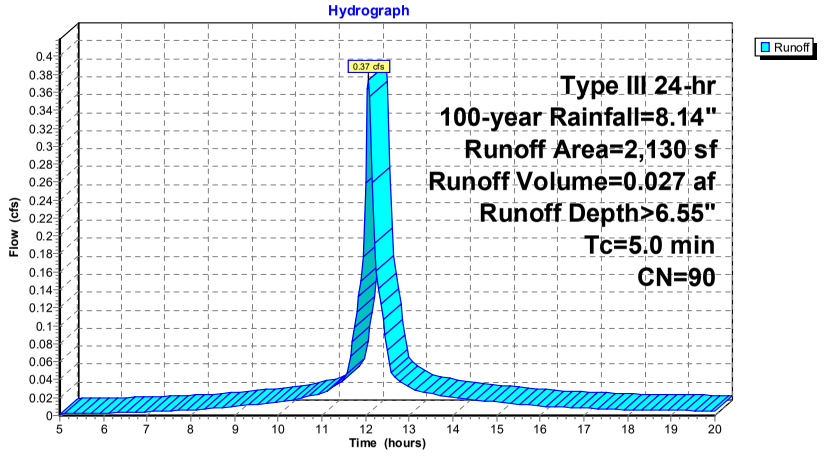
Runoff = 0.37 cfs @ 12.07 hrs, Volume= 0.027 af, Depth> 6.55"
Routed to Pond P2 : BMP 1 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Description
	703	74	>75% Grass cover, Good, HSG C
*	1,427	98	Stormwater Basin
	2,130	90	Weighted Average
	703		33.00% Pervious Area
	1,427		67.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-3: BMP 1 Basin 1 Direct Flow



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Summary for Subcatchment C-4: BMP 1 Basin 2 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

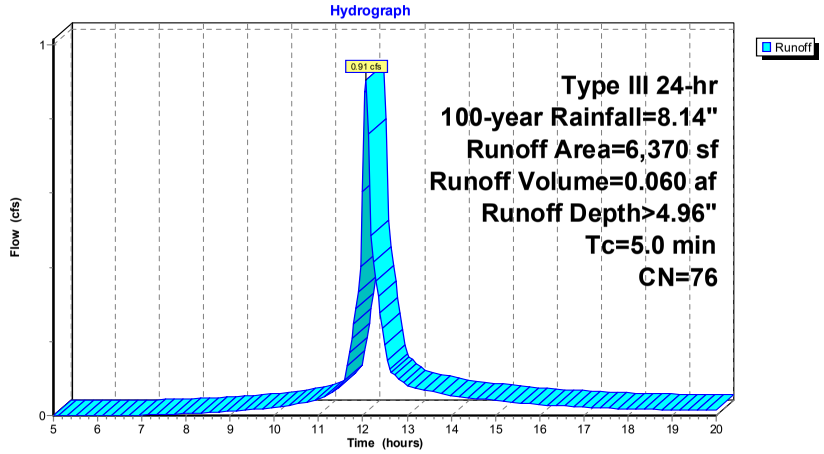
Runoff = 0.91 cfs @ 12.07 hrs, Volume= 0.060 af, Depth> 4.96"
Routed to Pond P3 : BMP 1 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Description
	5,753	74	>75% Grass cover, Good, HSG C
*	617	98	Stormwater Basin
	6,370	76	Weighted Average
	5,753		90.31% Pervious Area
	617		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-4: BMP 1 Basin 2 Direct Flow



Summary for Subcatchment C-5: BMP 2 Road

[49] Hint: Tc<2dt may require smaller dt

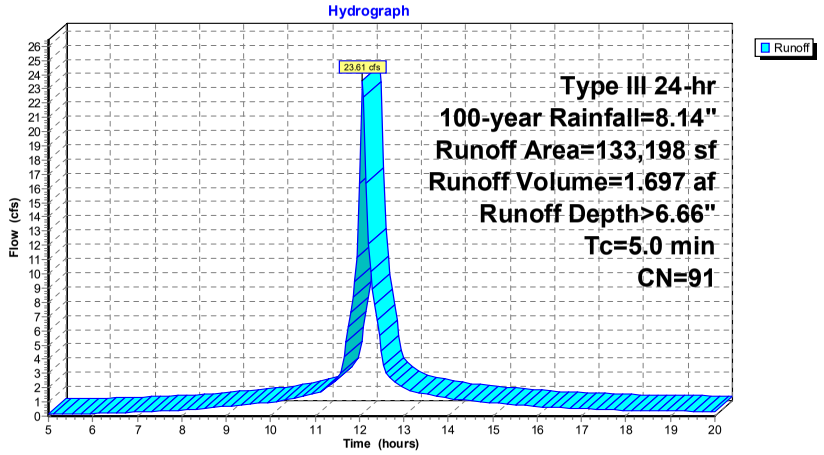
Runoff = 23.61 cfs @ 12.07 hrs, Volume= 1.697 af, Depth> 6.66"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

Area (sf)	CN	Description
26,950	74	>75% Grass cover, Good, HSG C
53,226	98	Unconnected pavement, HSG C
43,964	98	Unconnected pavement, HSG B
9,058	61	>75% Grass cover, Good, HSG B
133,198	91	Weighted Average
36,008		27.03% Pervious Area
97,190		72.97% Impervious Area
97,190		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-5: BMP 2 Road



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Summary for Subcatchment C-6: BMP 2 Basin 1

[49] Hint: Tc<2dt may require smaller dt

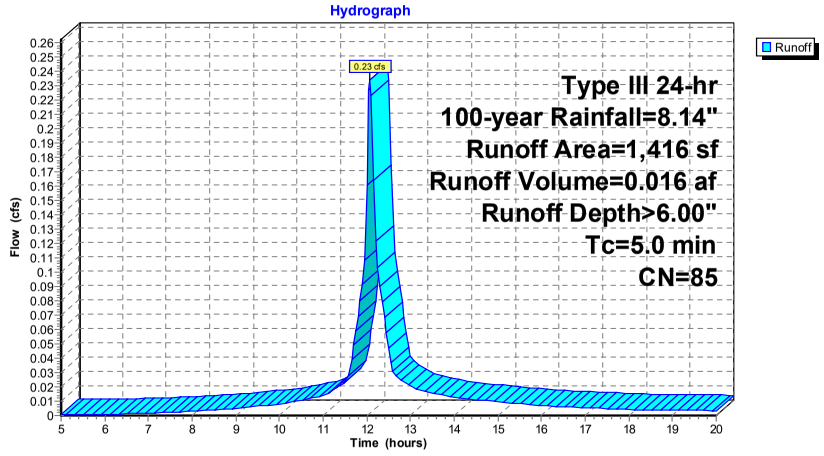
Runoff = 0.23 cfs @ 12.07 hrs, Volume= 0.016 af, Depth> 6.00"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Description
	793	74	>75% Grass cover, Good, HSG C
*	623	98	Stormwater Basin
	1,416	85	Weighted Average
	793		56.00% Pervious Area
	623		44.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-6: BMP 2 Basin 1



Summary for Subcatchment C-7: BMP 2 Basin 2

[49] Hint: Tc<2dt may require smaller dt

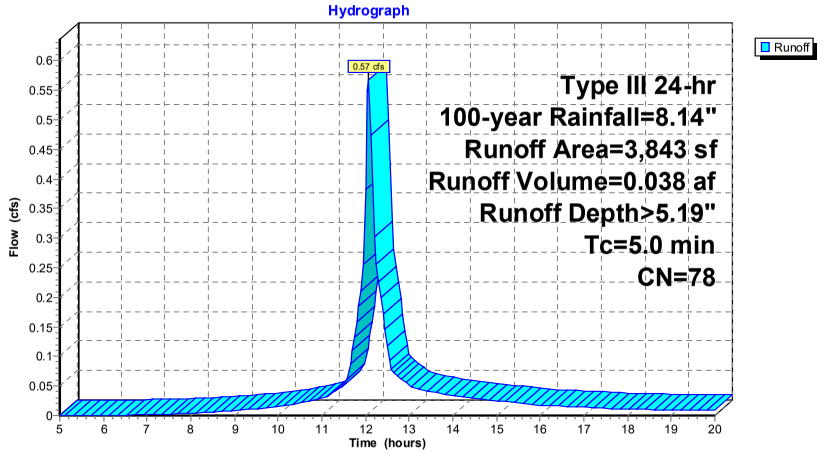
Runoff = 0.57 cfs @ 12.07 hrs, Volume= 0.038 af, Depth> 5.19"
Routed to Pond P5 : BMP 2 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.14"

	Area (sf)	CN	Description
	3,282	74	>75% Grass cover, Good, HSG C
*	561	98	Stormwater Basin
	3,843	78	Weighted Average
	3,282		85.40% Pervious Area
	561		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-7: BMP 2 Basin 2



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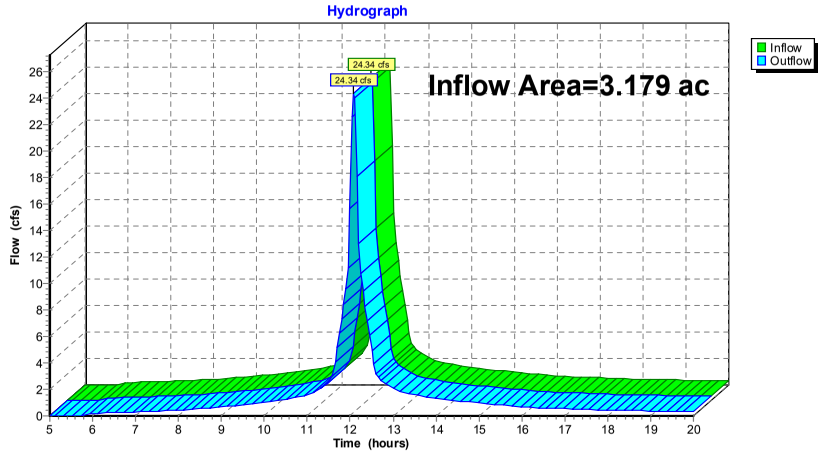
Summary for Reach DP-2: Existing Swale

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.179 ac, 71.05% Impervious, Inflow Depth > 6.53" for 100-year event
Inflow = 24.34 cfs @ 12.08 hrs, Volume= 1.731 af
Outflow = 24.34 cfs @ 12.08 hrs, Volume= 1.731 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Existing Swale



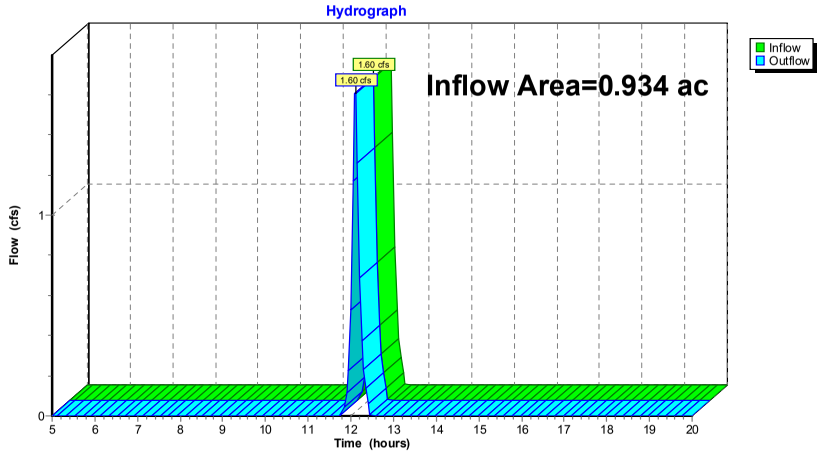
Summary for Reach DP1-A: Off-Site Sheet Flow

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.934 ac, 49.70% Impervious, Inflow Depth = 0.34" for 100-year event
Inflow = 1.60 cfs @ 12.10 hrs, Volume= 0.027 af
Outflow = 1.60 cfs @ 12.10 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-A: Off-Site Sheet Flow



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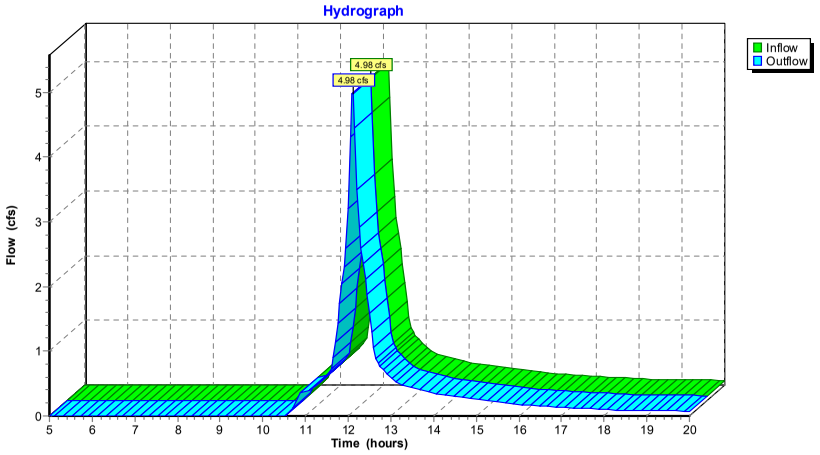
Summary for Reach DP1-B: Closed Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 4.98 cfs @ 12.10 hrs, Volume= 0.375 af
Outflow = 4.98 cfs @ 12.10 hrs, Volume= 0.375 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-B: Closed Drainage System



Summary for Pond P1: BMP 1 Basin 1 Forebay

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.739 ac, 56.47% Impervious, Inflow Depth > 6.33" for 100-year event
Inflow = 5.52 cfs @ 12.07 hrs, Volume= 0.390 af
Outflow = 5.49 cfs @ 12.08 hrs, Volume= 0.385 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 5.49 cfs @ 12.08 hrs, Volume= 0.380 af
Routed to Pond P2 : BMP 1 Basin 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.88' @ 12.08 hrs Surf.Area= 430 sf Storage= 343 cf

Plug-Flow detention time= 11.1 min calculated for 0.384 af (98% of inflow)
Center-of-Mass det. time= 5.6 min (758.4 - 752.8)

Volume	Invert	Avail.Storage	Storage Description
#1	432.50'	398 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
432.50	42	0	0
433.00	209	63	63
434.00	461	335	398

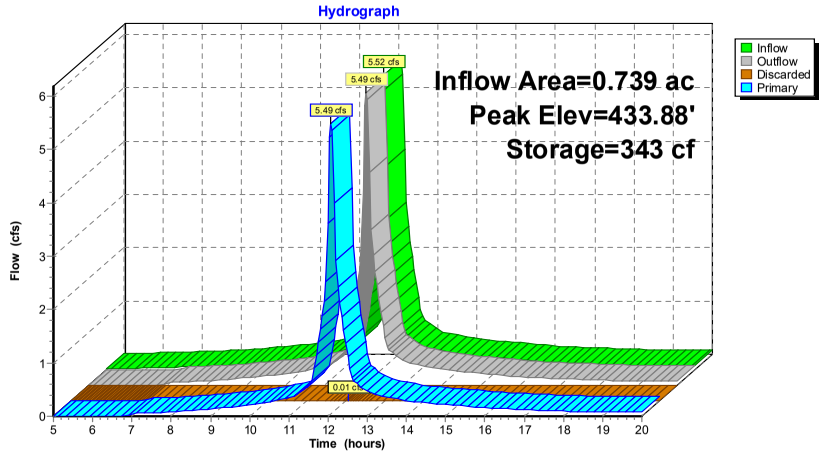
Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	432.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=433.87' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=5.30 cfs @ 12.08 hrs HW=433.87' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 5.30 cfs @ 1.38 fps)

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Pond P1: BMP 1 Basin 1 Forebay



Summary for Pond P2: BMP 1 Basin 1

[81] Warning: Exceeded Pond P1 by 0.15' @ 12.15 hrs

Inflow Area = 0.788 ac, 57.12% Impervious, Inflow Depth > 6.19" for 100-year event
Inflow = 5.86 cfs @ 12.08 hrs, Volume= 0.406 af
Outflow = 5.73 cfs @ 12.10 hrs, Volume= 0.368 af, Atten= 2%, Lag= 1.4 min
Discarded = 0.02 cfs @ 12.10 hrs, Volume= 0.015 af
Primary = 5.72 cfs @ 12.10 hrs, Volume= 0.353 af
Routed to Pond P3 : BMP 1 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 434.01' @ 12.10 hrs Surf.Area= 1,431 sf Storage= 2,246 cf

Plug-Flow detention time= 54.4 min calculated for 0.367 af (90% of inflow)
Center-of-Mass det. time= 23.7 min (781.3 - 757.6)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	2,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	416	0	0
432.00	586	251	251
433.00	974	780	1,031
434.00	1,427	1,201	2,231
434.50	1,594	755	2,986

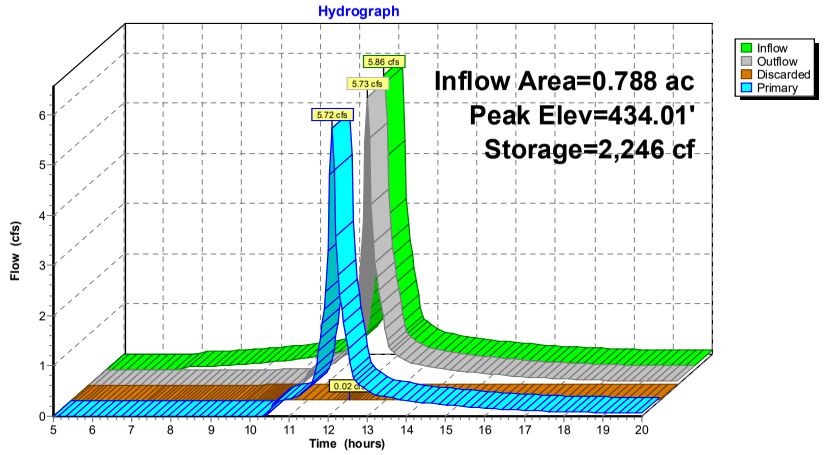
Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**7.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	431.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.10 hrs HW=434.01' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=5.69 cfs @ 12.10 hrs HW=434.01' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 5.69 cfs @ 1.77 fps)

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Pond P2: BMP 1 Basin 1



Summary for Pond P3: BMP 1 Basin 2

Inflow Area = 0.934 ac, 49.70% Impervious, Inflow Depth > 5.32" for 100-year event
Inflow = 6.59 cfs @ 12.10 hrs, Volume= 0.414 af
Outflow = 6.59 cfs @ 12.10 hrs, Volume= 0.406 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.005 af
Primary = 1.60 cfs @ 12.10 hrs, Volume= 0.027 af
Routed to Reach DP1-A : Off-Site Sheet Flow
Secondary = 4.98 cfs @ 12.10 hrs, Volume= 0.375 af
Routed to Reach DP1-B : Closed Drainage System

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 421.69' @ 12.10 hrs Surf.Area= 520 sf Storage= 491 cf

Plug-Flow detention time= 10.4 min calculated for 0.405 af (98% of inflow)
Center-of-Mass det. time= 3.7 min (782.4 - 778.7)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	1,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	103	0	0
421.00	308	206	206
422.00	616	462	668
422.50	726	336	1,003

Device	Routing	Invert	Outlet Devices
#1	Primary	421.50'	**8.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Secondary	421.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	420.00'	**0.520 in/hr Exfiltration over Surface area**

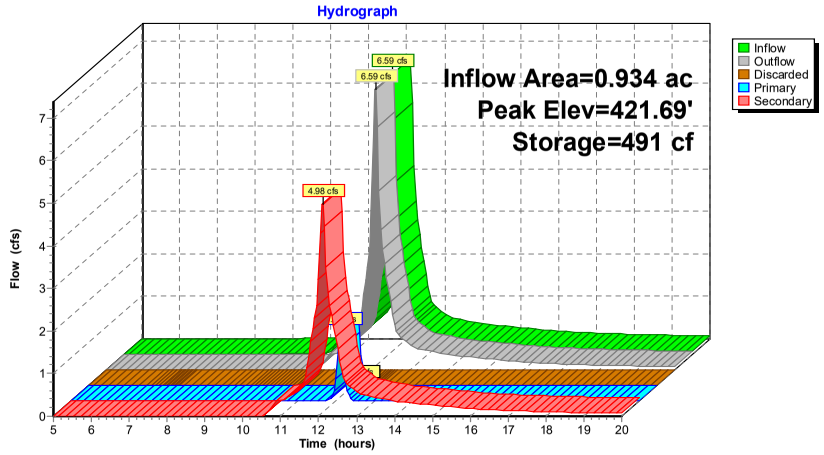
Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=421.69' (Free Discharge)
↑└**3=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.58 cfs @ 12.10 hrs HW=421.69' (Free Discharge)
↑└**1=Broad-Crested Rectangular Weir** (Weir Controls 1.58 cfs @ 1.06 fps)

Secondary OutFlow Max=4.95 cfs @ 12.10 hrs HW=421.69' (Free Discharge)
↑└**2=Orifice/Grate** (Weir Controls 4.95 cfs @ 2.03 fps)

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Pond P3: BMP 1 Basin 2



Summary for Pond P4: BMP 2 Basin 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 3.090 ac, 72.66% Impervious, Inflow Depth > 6.65" for 100-year event
Inflow = 23.84 cfs @ 12.07 hrs, Volume= 1.713 af
Outflow = 23.70 cfs @ 12.08 hrs, Volume= 1.707 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.006 af
Primary = 23.69 cfs @ 12.08 hrs, Volume= 1.702 af
Routed to Pond P5 : BMP 2 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 293.02' @ 12.08 hrs Surf.Area= 606 sf Storage= 694 cf

Plug-Flow detention time= 3.7 min calculated for 1.701 af (99% of inflow)
Center-of-Mass det. time= 1.9 min (748.6 - 746.7)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	1,012 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.00	110	0	0
292.00	325	218	218
293.00	600	463	680
293.50	729	332	1,012

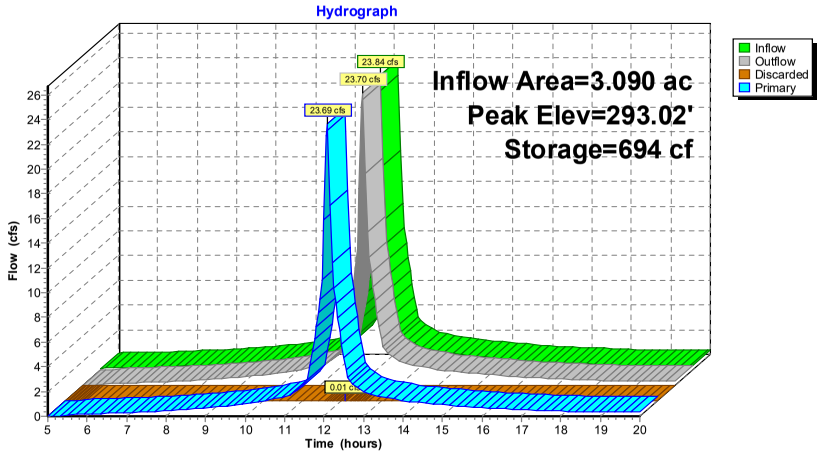
Device	Routing	Invert	Outlet Devices
#1	Primary	292.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	291.00'	**0.510 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=293.00' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=22.90 cfs @ 12.08 hrs HW=293.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 22.90 cfs @ 2.54 fps)

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Pond P4: BMP 2 Basin 1



Summary for Pond P5: BMP 2 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.179 ac, 71.05% Impervious, Inflow Depth > 6.57" for 100-year event
Inflow = 24.26 cfs @ 12.08 hrs, Volume= 1.740 af
Outflow = 24.34 cfs @ 12.08 hrs, Volume= 1.735 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 24.34 cfs @ 12.08 hrs, Volume= 1.731 af
Routed to Reach DP-2 : Existing Swale

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 284.04' @ 12.08 hrs Surf.Area= 572 sf Storage= 580 cf

Plug-Flow detention time= 2.4 min calculated for 1.730 af (99% of inflow)
Center-of-Mass det. time= 1.3 min (750.4 - 749.1)

Volume	Invert	Avail.Storage	Storage Description
#1	282.00'	867 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
282.00	25	0	0
283.00	263	144	144
284.00	563	413	557
284.50	675	310	867

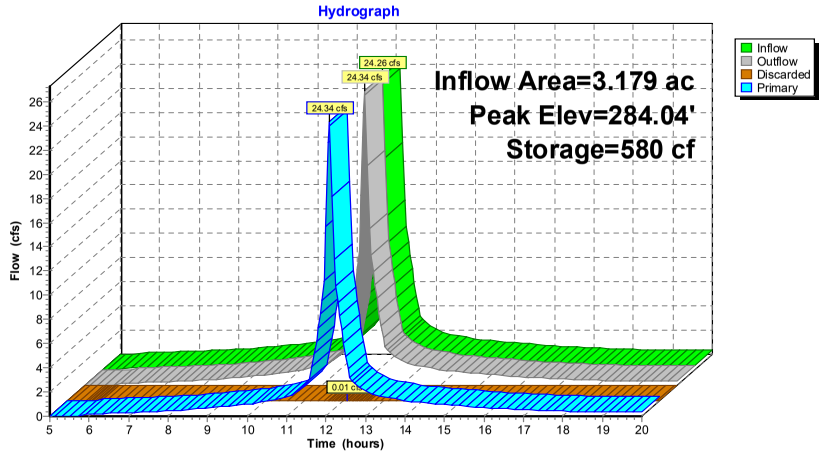
Device	Routing	Invert	Outlet Devices
#1	Discarded	282.00'	**0.510 in/hr Exfiltration over Surface area**
#2	Primary	283.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=284.02' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=23.56 cfs @ 12.08 hrs HW=284.02' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 23.56 cfs @ 2.56 fps)

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Pond P5: BMP 2 Basin 2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentC-1: BMP 1 Road Runoff Area=26,716 sf 60.54% Impervious Runoff Depth>0.26"
Tc=5.0 min CN=89 Runoff=0.19 cfs 0.013 af

SubcatchmentC-2: BMP 1 Basin 1 Forebay Runoff Area=5,476 sf 36.61% Impervious Runoff Depth>0.12"
Tc=5.0 min CN=83 Runoff=0.01 cfs 0.001 af

SubcatchmentC-3: BMP 1 Basin 1 Direct Runoff Area=2,130 sf 67.00% Impervious Runoff Depth>0.29"
Tc=5.0 min CN=90 Runoff=0.02 cfs 0.001 af

SubcatchmentC-4: BMP 1 Basin 2 Direct Runoff Area=6,370 sf 9.69% Impervious Runoff Depth>0.03"
Tc=5.0 min CN=76 Runoff=0.00 cfs 0.000 af

SubcatchmentC-5: BMP 2 Road Runoff Area=133,198 sf 72.97% Impervious Runoff Depth>0.33"
Tc=5.0 min CN=91 Runoff=1.25 cfs 0.084 af

SubcatchmentC-6: BMP 2 Basin 1 Runoff Area=1,416 sf 44.00% Impervious Runoff Depth>0.15"
Tc=5.0 min CN=85 Runoff=0.01 cfs 0.000 af

SubcatchmentC-7: BMP 2 Basin 2 Runoff Area=3,843 sf 14.60% Impervious Runoff Depth>0.05"
Tc=5.0 min CN=78 Runoff=0.00 cfs 0.000 af

Reach DP-2: Existing Swale Inflow=1.29 cfs 0.069 af
Outflow=1.29 cfs 0.069 af

Reach DP1-A: Off-Site Sheet Flow Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP1-B: Closed Drainage System Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond P1: BMP 1 Basin 1 Forebay Peak Elev=433.57' Storage=223 cf Inflow=0.20 cfs 0.014 af
Discarded=0.00 cfs 0.003 af Primary=0.09 cfs 0.007 af Outflow=0.09 cfs 0.009 af

Pond P2: BMP 1 Basin 1 Peak Elev=431.91' Storage=198 cf Inflow=0.10 cfs 0.008 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Pond P3: BMP 1 Basin 2 Peak Elev=420.01' Storage=2 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond P4: BMP 2 Basin 1 Peak Elev=292.24' Storage=304 cf Inflow=1.25 cfs 0.084 af
Discarded=0.00 cfs 0.003 af Primary=1.26 cfs 0.075 af Outflow=1.26 cfs 0.078 af

Pond P5: BMP 2 Basin 2 Peak Elev=283.24' Storage=214 cf Inflow=1.26 cfs 0.076 af
Discarded=0.00 cfs 0.002 af Primary=1.29 cfs 0.069 af Outflow=1.30 cfs 0.072 af

Total Runoff Area = 4.113 ac Runoff Volume = 0.101 af Average Runoff Depth = 0.29"
33.80% Pervious = 1.390 ac 66.20% Impervious = 2.723 ac

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Summary for Subcatchment C-1: BMP 1 Road

[49] Hint: Tc<2dt may require smaller dt

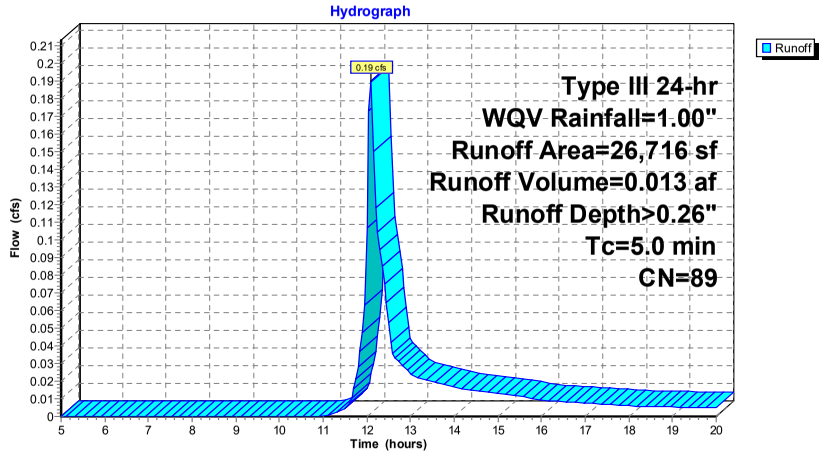
Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.013 af, Depth> 0.26"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQV Rainfall=1.00"

Area (sf)	CN	Description
10,542	74	>75% Grass cover, Good, HSG C
16,174	98	Unconnected pavement, HSG C
26,716	89	Weighted Average
10,542		39.46% Pervious Area
16,174		60.54% Impervious Area
16,174		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-1: BMP 1 Road



Summary for Subcatchment C-2: BMP 1 Basin 1 Forebay

[49] Hint: Tc<2dt may require smaller dt

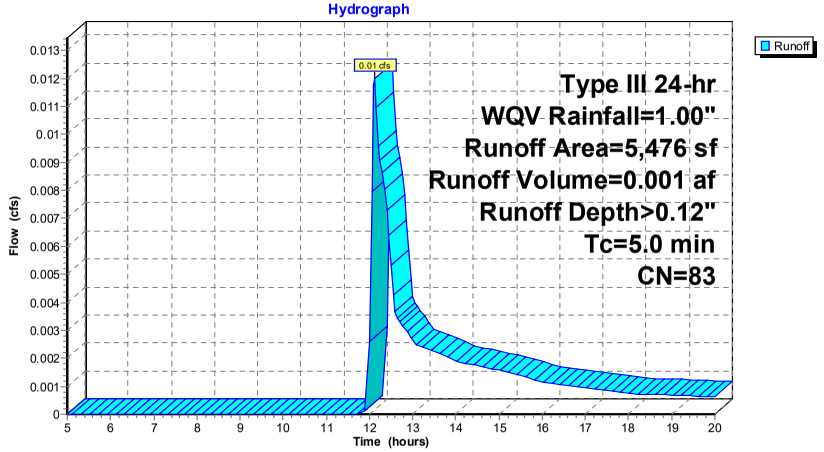
Runoff = 0.01 cfs @ 12.12 hrs, Volume= 0.001 af, Depth> 0.12"
Routed to Pond P1 : BMP 1 Basin 1 Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQV Rainfall=1.00"

Area (sf)	CN	Description
3,471	74	>75% Grass cover, Good, HSG C
* 461	98	Stormwater Basin
1,544	98	Unconnected pavement, HSG C
5,476	83	Weighted Average
3,471		63.39% Pervious Area
2,005		36.61% Impervious Area
1,544		77.01% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-2: BMP 1 Basin 1 Forebay



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Summary for Subcatchment C-3: BMP 1 Basin 1 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

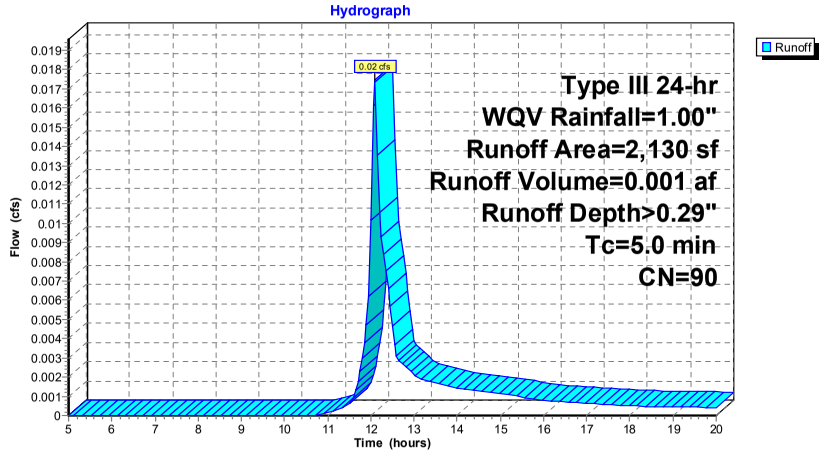
Runoff = 0.02 cfs @ 12.09 hrs, Volume= 0.001 af, Depth> 0.29"
Routed to Pond P2 : BMP 1 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQV Rainfall=1.00"

	Area (sf)	CN	Description
	703	74	>75% Grass cover, Good, HSG C
*	1,427	98	Stormwater Basin
	2,130	90	Weighted Average
	703		33.00% Pervious Area
	1,427		67.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-3: BMP 1 Basin 1 Direct Flow



Summary for Subcatchment C-4: BMP 1 Basin 2 Direct Flow

[49] Hint: Tc<2dt may require smaller dt

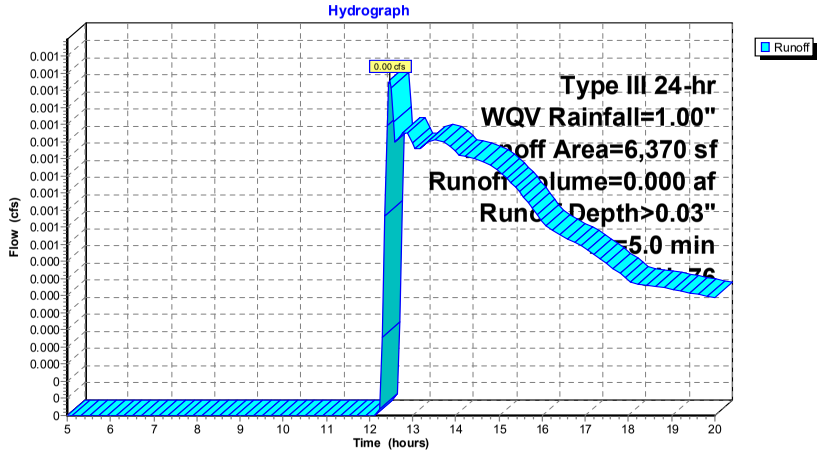
Runoff = 0.00 cfs @ 12.47 hrs, Volume= 0.000 af, Depth> 0.03"
Routed to Pond P3 : BMP 1 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQV Rainfall=1.00"

	Area (sf)	CN	Description
	5,753	74	>75% Grass cover, Good, HSG C
*	617	98	Stormwater Basin
	6,370	76	Weighted Average
	5,753		90.31% Pervious Area
	617		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-4: BMP 1 Basin 2 Direct Flow



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Summary for Subcatchment C-5: BMP 2 Road

[49] Hint: Tc<2dt may require smaller dt

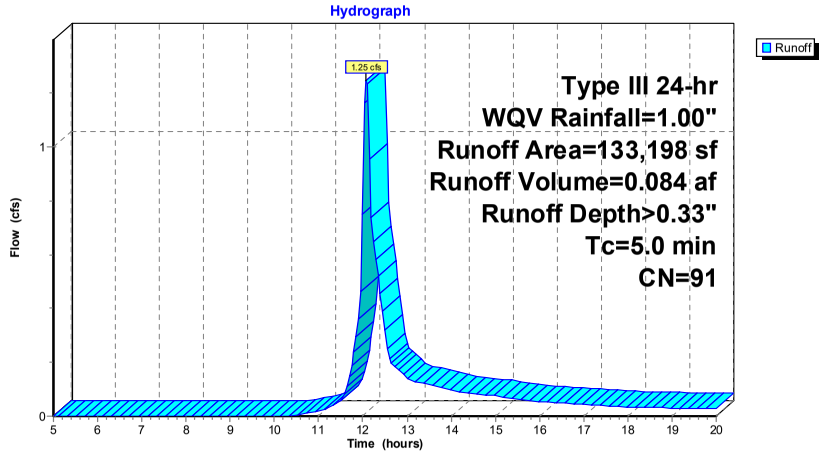
Runoff = 1.25 cfs @ 12.09 hrs, Volume= 0.084 af, Depth> 0.33"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQV Rainfall=1.00"

Area (sf)	CN	Description
26,950	74	>75% Grass cover, Good, HSG C
53,226	98	Unconnected pavement, HSG C
43,964	98	Unconnected pavement, HSG B
9,058	61	>75% Grass cover, Good, HSG B
133,198	91	Weighted Average
36,008		27.03% Pervious Area
97,190		72.97% Impervious Area
97,190		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-5: BMP 2 Road



Summary for Subcatchment C-6: BMP 2 Basin 1

[49] Hint: Tc<2dt may require smaller dt

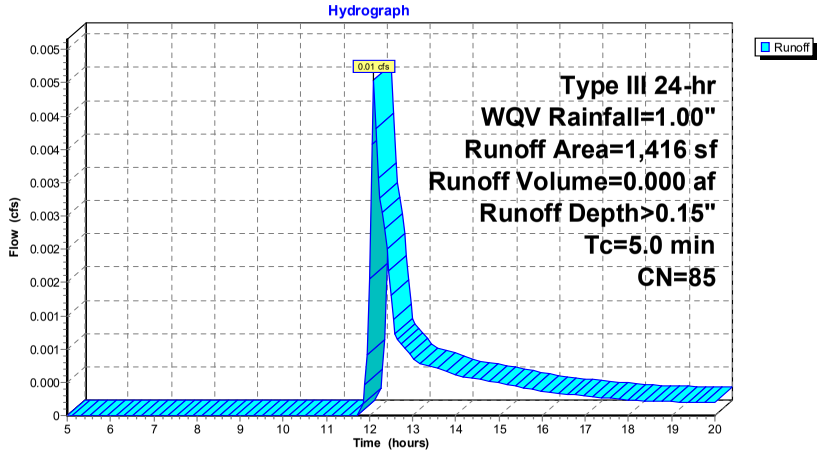
Runoff = 0.01 cfs @ 12.10 hrs, Volume= 0.000 af, Depth> 0.15"
Routed to Pond P4 : BMP 2 Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQV Rainfall=1.00"

	Area (sf)	CN	Description
	793	74	>75% Grass cover, Good, HSG C
*	623	98	Stormwater Basin
	1,416	85	Weighted Average
	793		56.00% Pervious Area
	623		44.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C-6: BMP 2 Basin 1



Proposal No. 608491-131468
A00860 - 266

Summary for Subcatchment C-7: BMP 2 Basin 2

[49] Hint: Tc<2dt may require smaller dt

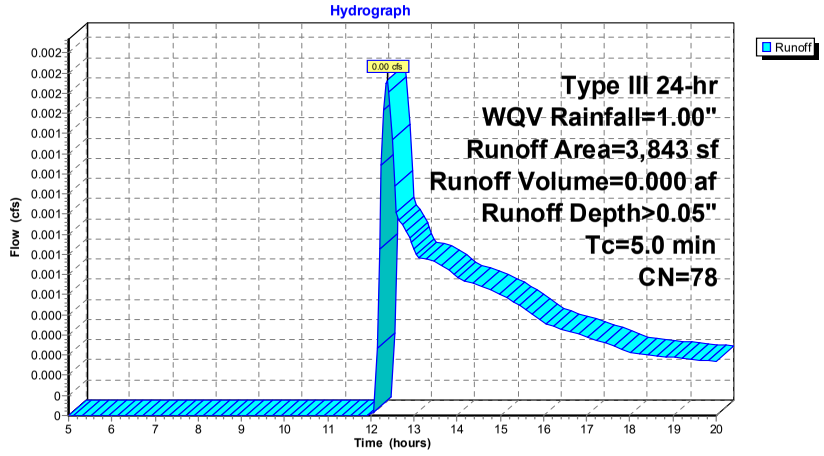
Runoff = 0.00 cfs @ 12.38 hrs, Volume= 0.000 af, Depth> 0.05"
Routed to Pond P5 : BMP 2 Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQV Rainfall=1.00"

	Area (sf)	CN	Description
	3,282	74	>75% Grass cover, Good, HSG C
*	561	98	Stormwater Basin
	3,843	78	Weighted Average
	3,282		85.40% Pervious Area
	561		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment C-7: BMP 2 Basin 2



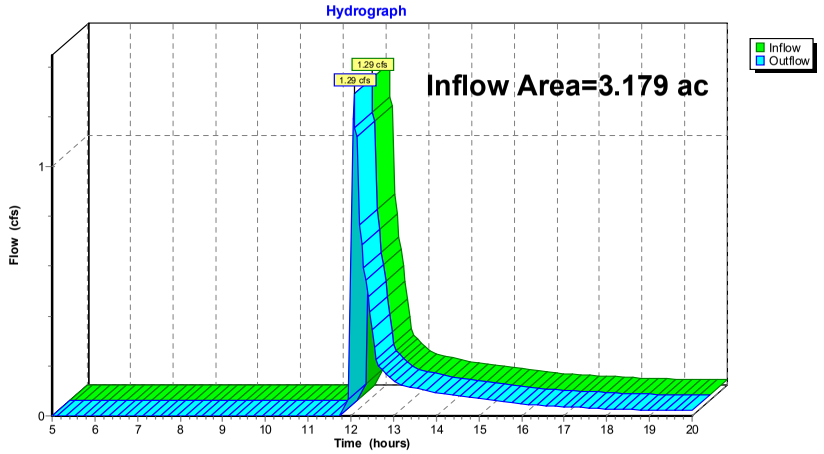
Summary for Reach DP-2: Existing Swale

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.179 ac, 71.05% Impervious, Inflow Depth > 0.26" for WQV event
Inflow = 1.29 cfs @ 12.07 hrs, Volume= 0.069 af
Outflow = 1.29 cfs @ 12.07 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Existing Swale



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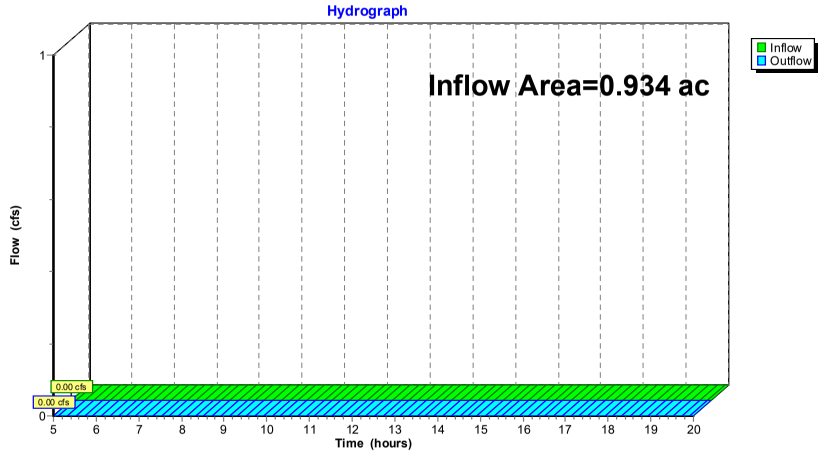
Summary for Reach DP1-A: Off-Site Sheet Flow

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.934 ac, 49.70% Impervious, Inflow Depth = 0.00" for WQV event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-A: Off-Site Sheet Flow



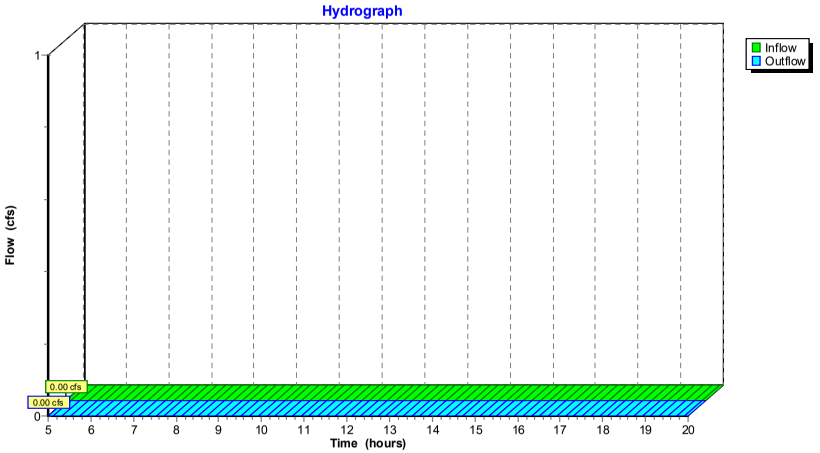
Summary for Reach DP1-B: Closed Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP1-B: Closed Drainage System



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Summary for Pond P1: BMP 1 Basin 1 Forebay

Inflow Area = 0.739 ac, 56.47% Impervious, Inflow Depth > 0.23" for WQV event
Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.014 af
Outflow = 0.09 cfs @ 12.41 hrs, Volume= 0.009 af, Atten= 53%, Lag= 18.8 min
Discarded = 0.00 cfs @ 12.41 hrs, Volume= 0.003 af
Primary = 0.09 cfs @ 12.41 hrs, Volume= 0.007 af
Routed to Pond P2 : BMP 1 Basin 1

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.57' @ 12.41 hrs Surf.Area= 353 sf Storage= 223 cf

Plug-Flow detention time= 133.5 min calculated for 0.009 af (66% of inflow)
Center-of-Mass det. time= 54.5 min (880.9 - 826.3)

Volume	Invert	Avail.Storage	Storage Description
#1	432.50'	398 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
432.50	42	0	0
433.00	209	63	63
434.00	461	335	398

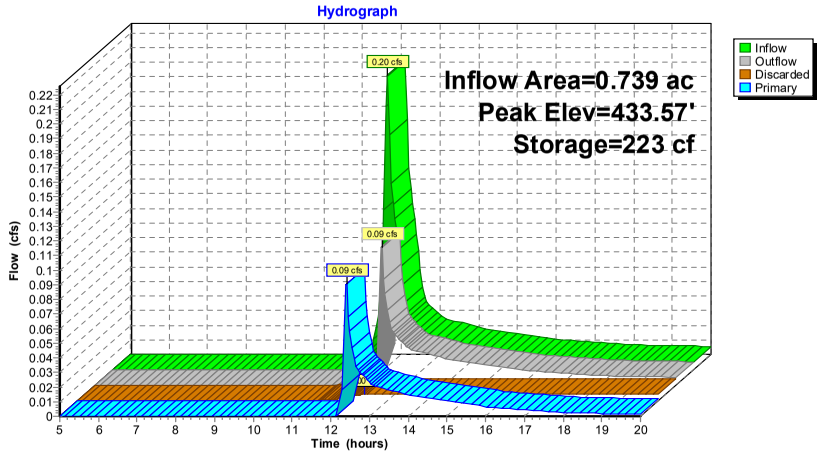
Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	432.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 12.41 hrs HW=433.57' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.08 cfs @ 12.41 hrs HW=433.57' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 0.08 cfs @ 0.34 fps)

Proposal No. 608491-131468

Pond P1: BMP 1 Basin 1 Forebay



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Summary for Pond P2: BMP 1 Basin 1

Inflow Area = 0.788 ac, 57.12% Impervious, Inflow Depth > 0.12" for WQV event
Inflow = 0.10 cfs @ 12.40 hrs, Volume= 0.008 af
Outflow = 0.01 cfs @ 16.18 hrs, Volume= 0.004 af, Atten= 93%, Lag= 226.4 min
Discarded = 0.01 cfs @ 16.18 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Pond P3 : BMP 1 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 431.91' @ 16.18 hrs Surf.Area= 555 sf Storage= 198 cf

Plug-Flow detention time= 201.0 min calculated for 0.004 af (54% of inflow)
Center-of-Mass det. time= 121.0 min (965.2 - 844.1)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	2,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

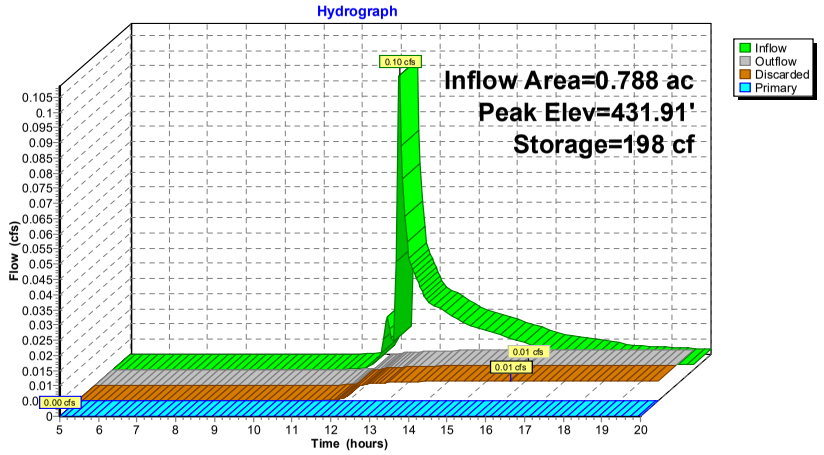
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	416	0	0
432.00	586	251	251
433.00	974	780	1,031
434.00	1,427	1,201	2,231
434.50	1,594	755	2,986

Device	Routing	Invert	Outlet Devices
#1	Primary	433.55'	**7.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	431.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 16.18 hrs HW=431.91' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=431.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: BMP 1 Basin 1



Proposal No. 608491-131468
A00860 - 270

Summary for Pond P3: BMP 1 Basin 2

Inflow Area = 0.934 ac, 49.70% Impervious, Inflow Depth > 0.00" for WQV event
Inflow = 0.00 cfs @ 12.47 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 14.11 hrs, Volume= 0.000 af, Atten= 23%, Lag= 98.4 min
Discarded = 0.00 cfs @ 14.11 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Reach DP1-A : Off-Site Sheet Flow
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Reach DP1-B : Closed Drainage System

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 420.01' @ 14.11 hrs Surf.Area= 106 sf Storage= 2 cf

Plug-Flow detention time= 33.0 min calculated for 0.000 af (95% of inflow)
Center-of-Mass det. time= 21.0 min (951.3 - 930.4)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	1,003 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	103	0	0
421.00	308	206	206
422.00	616	462	668
422.50	726	336	1,003

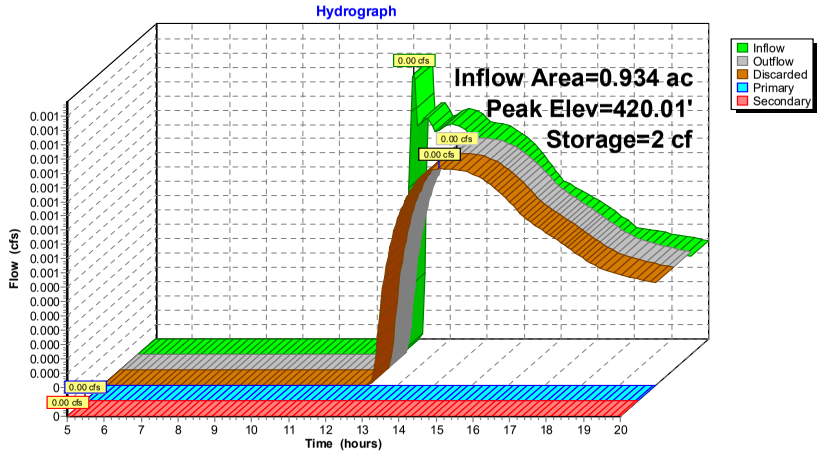
Device	Routing	Invert	Outlet Devices
#1	Primary	421.50'	**8.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Secondary	421.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	420.00'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 14.11 hrs HW=420.01' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=420.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=420.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond P3: BMP 1 Basin 2



Proposal No. 608491-131468
A00860 - 271

Summary for Pond P4: BMP 2 Basin 1

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.090 ac, 72.66% Impervious, Inflow Depth > 0.33" for WQV event
Inflow = 1.25 cfs @ 12.09 hrs, Volume= 0.084 af
Outflow = 1.26 cfs @ 12.10 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.6 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 0.003 af
Primary = 1.26 cfs @ 12.10 hrs, Volume= 0.075 af
Routed to Pond P5 : BMP 2 Basin 2

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 292.24' @ 12.10 hrs Surf.Area= 391 sf Storage= 304 cf

Plug-Flow detention time= 32.9 min calculated for 0.078 af (93% of inflow)
Center-of-Mass det. time= 9.7 min (822.7 - 813.0)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	1,012 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.00	110	0	0
292.00	325	218	218
293.00	600	463	680
293.50	729	332	1,012

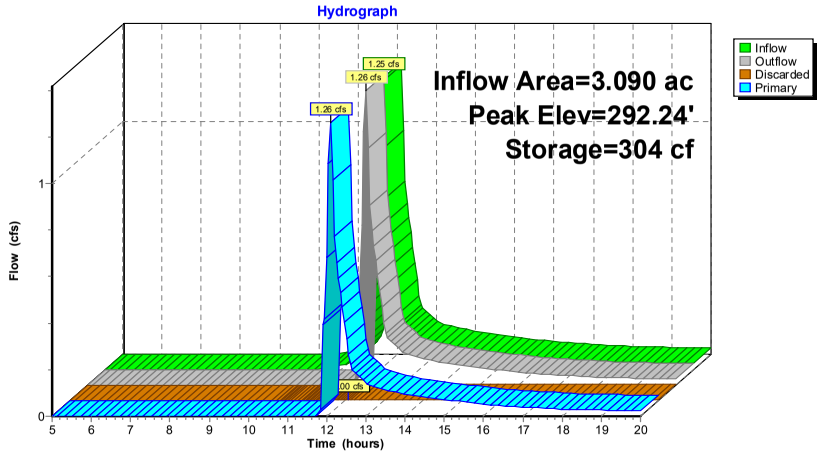
Device	Routing	Invert	Outlet Devices
#1	Primary	292.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	291.00'	**0.510 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=292.24' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.24 cfs @ 12.10 hrs HW=292.24' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 1.24 cfs @ 0.89 fps)

Proposal No. 608491-131468

Pond P4: BMP 2 Basin 1



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Summary for Pond P5: BMP 2 Basin 2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.179 ac, 71.05% Impervious, Inflow Depth > 0.29" for WQV event
Inflow = 1.26 cfs @ 12.10 hrs, Volume= 0.076 af
Outflow = 1.30 cfs @ 12.07 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.05 hrs, Volume= 0.002 af
Primary = 1.29 cfs @ 12.07 hrs, Volume= 0.069 af
Routed to Reach DP-2 : Existing Swale

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 283.24' @ 12.05 hrs Surf.Area= 334 sf Storage= 214 cf

Plug-Flow detention time= 24.2 min calculated for 0.072 af (94% of inflow)
Center-of-Mass det. time= 6.4 min (825.0 - 818.6)

Volume	Invert	Avail.Storage	Storage Description
#1	282.00'	867 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

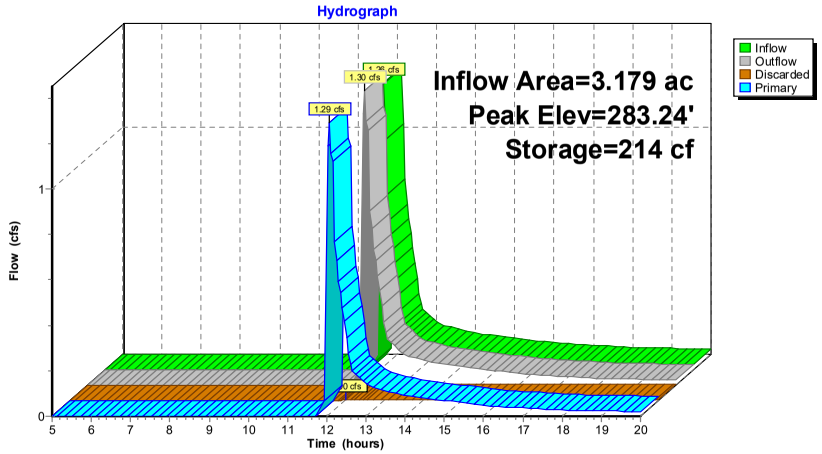
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
282.00	25	0	0
283.00	263	144	144
284.00	563	413	557
284.50	675	310	867

Device	Routing	Invert	Outlet Devices
#1	Discarded	282.00'	**0.510 in/hr Exfiltration over Surface area**
#2	Primary	283.10'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.00 cfs @ 12.05 hrs HW=283.24' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.17 cfs @ 12.07 hrs HW=283.23' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.17 cfs @ 0.87 fps)

Pond P5: BMP 2 Basin 2



Proposal No. 608491-131468
A00860 - 273

HNTB	The HNTB Companies	Done by: DCS	Date	2/13/24	Job Number	70095
		Checked by: WJS	Date			

70095: Uxbridge Road, Hastings Street, Milford Street (Route 16), Mendon, MA: Project File No. 608491

STANDARD 3: RECHARGE VOLUME

BMP 1 - Basin 1

Required Recharge Volume Calculation

Hydrologic Soil Code	Impervious Area (sf)	Target Depth Factor (in.)	Required Recharge Volume (cf)	Basin Recharge Volume (cf)
B	17,718	0.35	517	1851

Recharge Volume Provided > Required Recharge Volume

Forebay Volume

Invert = 433.55	
Elevation (ft.)	**Area (sf)**
432.5	42
433.0	209
434.0	461

Avg. Area 237 sf
Depth 1.50 ft
Volume 216 cf

Basin Volume

Invert = 433.55	
Elevation (ft.)	**Area (sf)**
431.5	416
432.0	586
433.0	974
434.0	1427
434.5	1594

Avg. Area 851 sf
Depth 2.5 ft
Volume 1635 cf

Drawdown Calculation

Drawdown Time (hr.) = Recharge Volume Provided (cf) / Bottom Area (sf) * 12 in./ft. / Infiltration Rate (in./hr.)

Infiltration Rate (in./hr.) = 0.52

Drawdown Time (hr.) = 64

Drawdown Time (hr.) < 72 hrs.

STANDARD 4: WATER QUALITY VOLUME (MET TO MAXIMUM EXTENT PRACTICABLE)

Required Water Quality Volume Calculation

Required Water Quality Volume (cf) = Impervious Area Draining to the Infiltration Basin (sf) * 1 inch * 1 ft./12 in.

Impervious Area Draining to the Infiltration Basin (sf) = 17,718

Required Water Quality Volume (cf) = 1477 125%

Water Quality Volume Provided = 125% of the Required Water Quality Volume

HNTB	The HNTB Companies	Done by: WS	Date 1/16/24	Job Number 70095
		Checked by: CTN	Date 1/16/24	

70095: Uxbridge Road, Hastings Street, Milford Street (Route 16), Mendon, MA: Project File No. 608491

STANDARD 3: RECHARGE VOLUME

BMP 1 - Basin 2

Required Recharge Volume Calculation

Hydrologic Soil Code	Impervious Area (sf)	Target Depth Factor (in.)	Required Recharge Volume (cf)	Basin Recharge Volume (cf)
B	0	0.35	0	312

Recharge Volume Provided > Required Recharge Volume

Basin Volume

Invert = 421.3	
Elevation (ft.)	**Area (sf)**
420.0	103
421.0	308
422.0	616
422.5	726

Avg. Area 438 sf
Depth 2.5 ft
Volume 312 cf

Drawdown Calculation

Drawdown Time (hr.) = Recharge Volume Provided (cf) / Bottom Area (sf) * 12 in./ft. / Infiltration Rate (in./hr.)

Infiltration Rate (in./hr.) = 0.52

Drawdown Time (hr.) = 70

Drawdown Time (hr.) < 72 hrs.

STANDARD 4: WATER QUALITY VOLUME (MET TO MAXIMUM EXTENT PRACTICABLE)

Required Water Quality Volume Calculation

Required Water Quality Volume (cf) = Impervious Area Draining to the Infiltration Basin (sf) * 1 inch * 1 ft./12 in.

Impervious Area Draining to the Infiltration Basin (sf) = 0

Required Water Quality Volume (cf) = 0 N/A

Water Quality Volume Provided = N/A% of the Required Water Quality Volume

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

Version 1, Automated: Mar. 4, 2008

Location: BMP 1 (Pretreatment)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56

Total TSS Removal = 44%

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

Project: Uxbridge Road Mendon
Prepared By: WJS
Date: 1/16/2024

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Proposal No. 608491-131468

A00860 - 276

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

Version 1, Automated: Mar. 4, 2008

Location: BMP 1 (Piped Flow)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
Grass Channel	0.50	0.15	0.08	0.08
Sediment Forebay	0.25	0.08	0.02	0.06
	0.00	0.06	0.00	0.06

Total TSS Removal = 94%

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

Project: Uxbridge Road Mendon
Prepared By: WJS
Date: 1/16/2024

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Proposal No. 608491-131468

A00860 - 277

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

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

Location: BMP 1 (Sheet Flow to Top Basin)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	0.80	1.00	0.80	0.20
Grass Channel	0.50	0.20	0.10	0.10
Sediment Forebay	0.25	0.10	0.03	0.08
	0.00	0.08	0.00	0.08
	0.00	0.08	0.00	0.08

Total TSS Removal = 93%

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

Project: Uxbridge Road Mendon

Prepared By: WJS

Date: 1/16/2024

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Proposal No. 608491-131468

A00860 - 278

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

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

Location: BMP 2

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Grass Channel	0.50	0.75	0.38	0.38
	0.00	0.38	0.00	0.38
	0.00	0.38	0.00	0.38
	0.00	0.38	0.00	0.38

Total TSS Removal = 63%

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

Project: Uxbridge Road Mendon

Prepared By: WJS

Date: 1/16/2024

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Proposal No. 608491-131468

A00860 - 279

Design of Grass Channels (Biofilter Swales) in accordance with MassDEP Stormwater Manual

Grassed channels (or biofilter swales) are a Best Management Practice (BMP) defined by the MassDEP Stormwater Manual as a treatment system with removal mechanisms of sedimentation and gravity filtration. To receive TSS credit, a sediment forebay must be provided – and it is for both designed grass channels on the project. Additional pretreatment is also provided by deep sump catch basins collecting runoff from the roadway.

To comply with the guidelines within the MassDEP BMP Manual, the following guidelines must be achieved by the grass channel design:

- Velocity in channel during the water quality storm must be less than 1 foot per second.
- The water depth during the water quality event must not exceed 4 inches in the grass channel.
- The grass channel must be designed to convey both the 2-year and 10-year 24-hour storms
    - The runoff velocities for the 2-year storm must not cause erosion problems
    - Freeboard must be provided for the 10-year storm

These parameters were checked for the two designed grass channels on the project – the channel connecting Basin 1 and Basin 2 for BMP 1 (Grass Channel #1), and the channel connecting the small forebays at BMP 2 (Grass Channel #2). Each swale was analyzed using Flowmaster software, which generally solves for open channel flow using the Manning's Equation, and inputs from the HydroCAD for the BMP design, included in Appendix F.

Grass Channel #1

Grass channel #1 has the following design characteristics: bottom width of 5 feet, side slopes of 3:1, and a slope of 6.67%. A trapezoidal channel with these characteristics was analyzed in FlowMaster using inputs from the HydroCAD model for the Water Quality Storm (1 inch), 2-year storm (3.37 inches), and 10 year storm (5.21 inches) for the contributing drainage areas discharging from the upstream infiltration basin. Normal depth was solved, to match the flow input and swale characteristics to the flow depth in the swale during each design storm. The results are tabulated below:

Storm	Rainfall (inches)	Flow (cfs)	Normal Depth (feet)	Velocity (ft/s)
Water Quality	1	0.19	0.04	0.9
2-year	3.37	2.09	0.17	2.22
10-year	5.21	3.74	0.24	2.72

As demonstrated above: the velocity in the water quality storm is below 1 foot per second, the water depth is less than 4 inches in the WQ event (0.04 feet), the 2-year storm has a velocity below 4 feet per second (permissible velocity for channel with a slope between 5 and 10 percent), and 9 inches of freeboard is provided in the 10-year storm.

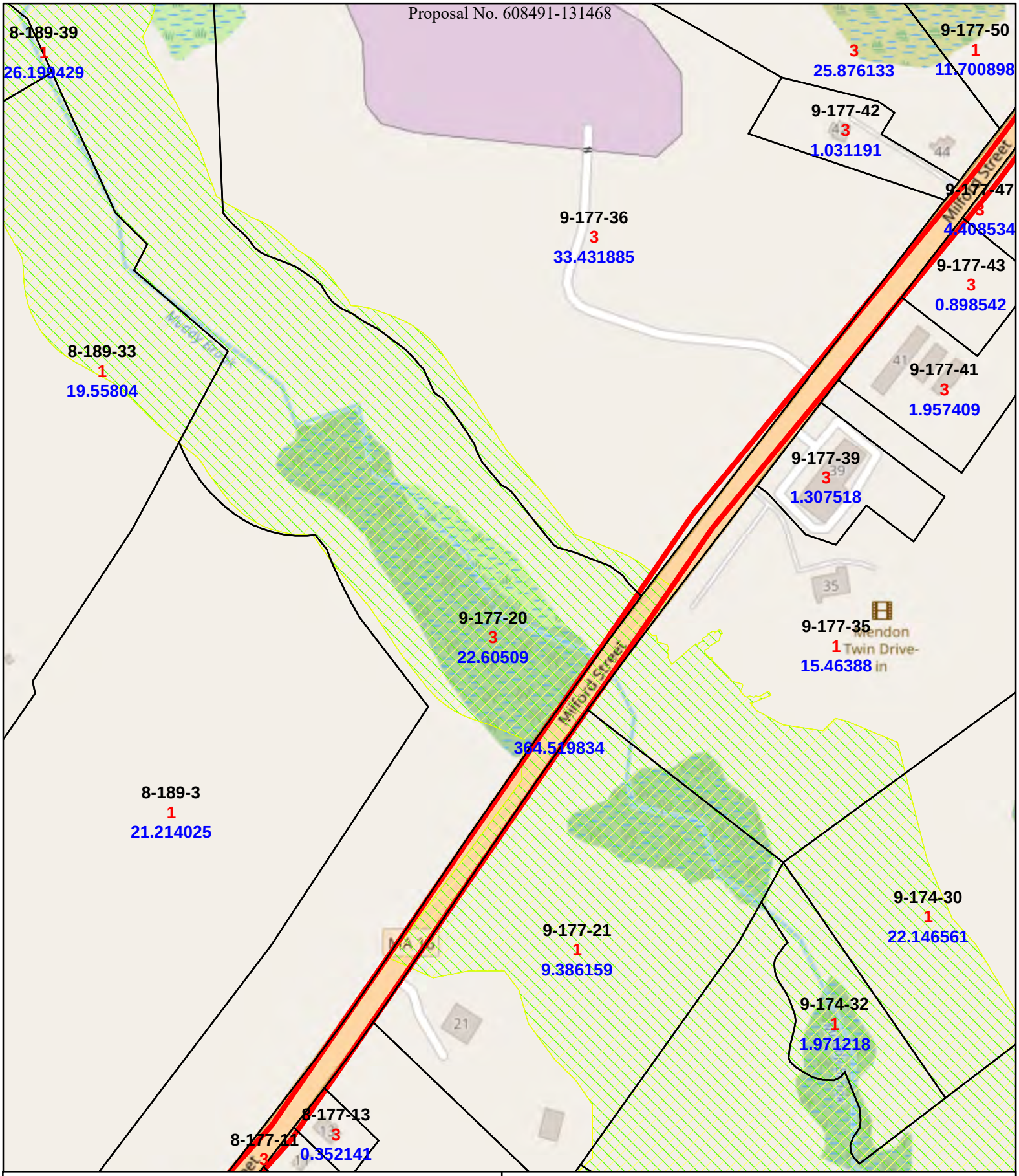
Grass Channel #2

Grass channel #1 has the following design characteristics: bottom width of 5 feet, side slopes of 3:1, and a slope of 8.33%. A trapezoidal channel with these characteristics was analyzed in FlowMaster using inputs from the HydroCAD model for the Water Quality Storm (1 inch), 2-year storm (3.37 inches), and 10 year storm (5.21 inches) for the contributing drainage areas discharging from the upstream infiltration basin. Normal depth was solved, to match the flow input and swale characteristics to the flow depth in the swale during each design storm. The results are tabulated below:

Storm	Rainfall (inches)	Flow (cfs)	Normal Depth (feet)	Velocity (ft/s)
Water Quality	1	1.21	0.11	1.81
2-year	3.37	8.24	0.33	3.62
10-year	5.21	13.88	0.44	4.31

As demonstrated above:, the water depth is less than 4 inches in the WQ event (0.11feet), the 2-year storm has a velocity below 4 feet per second (permissible velocity for channel with a slope between 5 and 10 percent, and a minimum of 6 inches of freeboard is provided in the 10-year storm. While the velocity in the water quality storm is above 1 foot per second, additional velocity control measures (the forebays and checkdams) will help reduce the speed of flow, and provide water quality benefits for the channel.

Appendix F – Supplemental Information for Streamlined Massachusetts Endangered Species Act/Wetland Protection Review



Parcel Map
Resurfacing and Related Work on Route 16
Mendon, MA

Legend

- Project Corridor
- Parcel Boundary
- NHESP Priority Habitat
- NHESP Estimated Habitat

0 250 500 750 1,000 Feet

N

Appendix F
Figure 1

HNTB MassDOT Massachusetts Department of Transportation Highway Division

Boston, MA | April 2023



Aerial Map
Resurfacing and Related Work on Route 16
Mendon, MA

Legend

Project Corridor

N

0 250 500 750 1,000 Feet

Appendix F
Figure 2

HNTB massDOT Massachusetts Department of Transportation Highway Division

Boston, MA | April 2023

Appendix F – Photographic Log



Photo 1: View of project corridor at Muddy Brook along Route 16 facing West. Photo taken from Google Earth Street View, August 2022.



Photo 2: View of project corridor at Muddy Brook along Route 16 facing East. Photo taken from Google Earth Street View, August 2022.



Photo 3: View of project corridor along Route 16 facing East toward the Mendon Twin Drive-In. Photo taken from Google Earth Street View, August 2022.



Photo 3: View of project corridor along Route 16 facing West toward Zook Custom Kitchens. Photo taken from Google Earth Street View, August 2022.

From: CERO_NOI@MassMail.state.ma.us <CERO_NOI@MassMail.state.ma.us>
Sent: Thursday, August 15, 2024 11:07 AM
To: Larner, Erica N. (DOT) <erica.n.larner@dot.state.ma.us>; mseifert@hntb.com; Weigel, Bryanna (DEP) <Bryanna.Weigel@mass.gov>
Cc: CERO_NOI (DEP) <cero_noi@mass.gov>; igenova@mendonma.gov; concom@mendonma.gov; CERO_NOI (DEP) <cero_noi@mass.gov>
Subject: MassDEP NOI File Number

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CENTRAL REGIONAL OFFICE
8 NEW BOND STREET, WORCESTER, MA 01606 508-792-7650

Date: 08/15/2024 Municipality MENDON

RE: **NOTIFICATION OF WETLANDS PROTECTION ACT FILE NUMBER**

The Department of Environmental Protection has received a Notice of Intent filed in accordance with the Wetlands Protection Act (M.G.L. c. 131, §40):

Applicant	MASSACHUSETTS DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION	**Owner Address**
Address	10 PARK PLAZA, ROOM 7360,BOSTON MA 02116	
Locus	ROUTE 16 (UXBRIDGE ROAD) , MENDON MA 01756	

This project has been assigned the following file # : **CE 218-0853**

ISSUANCE OF A FILE NUMBER INDICATES ONLY COMPLETENESS OF SUBMITTAL, NOT APPROVAL OF APPLICATION

Although a file # is being issued, please note the following:

- As noted in the delineation report provided, changes were made to the boundaries of HNTB-C, HNTB-F, HNTB-G, Muddy Brook, Willow Brook, and Unnamed Stream Adjacent to HNTB-G resource areas. MassDEP recommends the Commission verify that resource area boundaries depicted on site plans are accurate in the field to confirm that Buffer Zones and Riverfront Area associated with Muddy Brook are accurately located.
- MassDEP recommends that the Applicant consider additional erosion controls that provide inlet protection for existing and proposed catch basins, such as silt sacks, throughout the duration of the project. Locations of proposed infiltration and surface basins should not be used as temporary sediment traps for construction activities, see V2, Ch2, p91 of the SW Handbook.
- It appears test pits were not performed at the location of the proposed infiltration and surface basins. The Applicant should demonstrate that design and siting criteria outlined for bioretention areas and rain gardens in Chapter 2 Volume 2 of the MA Stormwater Handbook have been met. Test pit soil logs should be provided to MassDEP and the Commission to confirm depth to SHGW and bedrock is at least 2 feet. If less than 4 feet, a mounding analysis is required. Project plans should be updated to show grades within proposed BMP areas.
- The Applicant proposes temporary and permanent impacts to BLSF, LUWW, Riverfront Area, and Bank resource areas. The Commission may consider incorporating restoration plans, a monitoring period of at least 2 years, and 75% survival rate of planted vegetation as a special condition in the Order of Conditions, if approved, to be considered in compliance at the time of issuing a Certificate of Compliance.
- The Applicant should confirm that there will be no impacts to BVW resource area, especially where the installation of concrete retaining walls at the inlet of Muddy Brook are proposed. The Commission may consider conditioning this work to occur during low-water or drawdown periods.
- The Applicant should provide calculations of existing and proposed peak rate runoff attenuation to demonstrate that compliance with Standard 2 has been met to the maximum extent practicable.
- The Applicant should confirm that calculations required to meet Standard 3 to the maximum extent practicable are correct. Required recharge volume should be calculated per hydrologic soil group that will be covered with impervious surfaces.
- The Applicant should implement and provide an Operations and Maintenance plan MassDEP and the Commission to demonstrate compliance with Standard 9. MassDEP recognizes that maintenance will likely consist of MassDOT's standard maintenance activities; however, a plan describing what the activities are, their frequency and annual cost should be provided in the review of the proposed project accordingly.
- An illicit discharge statement should be provided to MassDEP and the Commission to demonstrate compliance with Standard 10.
- Any conditions placed upon the project by NHESP as a result of the MESA review should be incorporated as special conditions in the Order of Conditions, if approved.
- MassDEP reminds the Commission of their ability to consider third party review per 310 CMR 10.05(4)(h).

Regards,

for MassDEP,

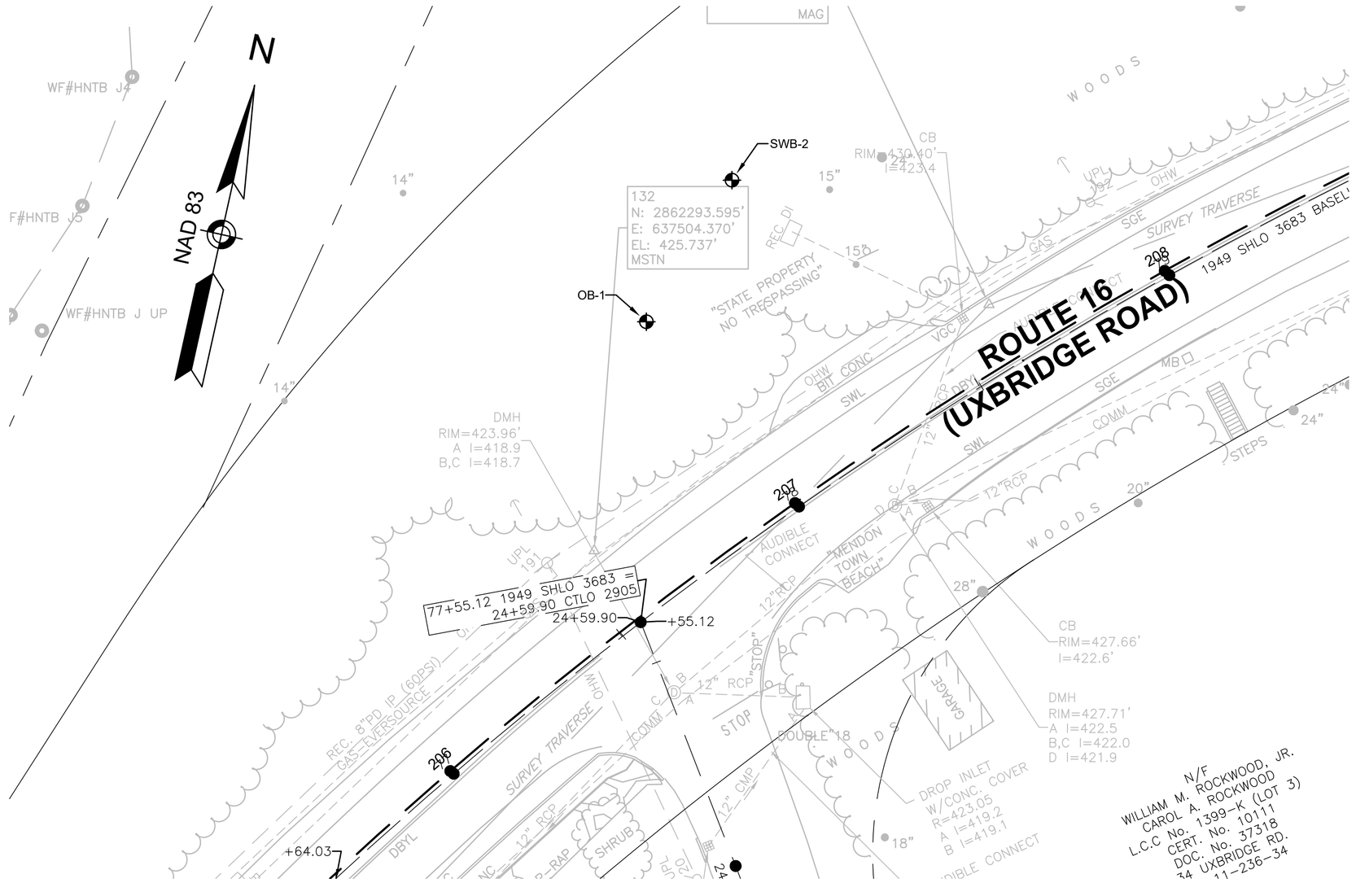
Bryanna.Weigel@mass.gov

Comment #	MassDEP Comment	Response/Discussion
1.	As noted in the delineation report provided, changes were made to the boundaries of HNTB-C, HNTB-F, HNTB-G, Muddy Brook, Willow Brook, and Unnamed Stream Adjacent to HNTB-G resource areas. MassDEP recommends the Commission verify that resource area boundaries depicted on site plans are accurate in the field to confirm that Buffer Zones and Riverfront Area associated with Muddy Brook are accurately located.	The changes to the wetland lines were due to an inaccurate GPS unit. Since the original delineation, we have bought a more accurate GPS unit. All Buffer Zones and RFA were updated to reflect the changes to the resource boundaries.
2.	MassDEP recommends that the Applicant consider additional erosion controls that provide inlet protection for existing and proposed catch basins, such as silt sacks, throughout the duration of the project. Locations of proposed infiltration and surface basins should not be used as temporary sediment traps for construction activities, see V2, Ch2, p91 of the SW Handbook.	Drain inlet protection will be provided for all existing and proposed drains throughout construction, as indicated on Sheet 36 of the plan set.
3.	It appears test pits were not performed at the location of the proposed infiltration and surface basins. The Applicant should demonstrate that design and siting criteria outlined for bioretention areas and rain gardens in Chapter 2 Volume 2 of the MA Stormwater Handbook have been met. Test pit soil logs should be provided to MassDEP and the Commission to confirm depth to SHGW and bedrock is at least 2 feet. If less than 4 feet, a mounding analysis is required. Project plans should be updated to show grades within proposed BMP areas.	Test pits were collected for areas near the BMPs. The test pit information is included as an attachment to this response to the comment log. BMP-1 (infiltration basin): No bedrock was encountered. The infiltration basin has a max cut of roughly 6 ft and is closer to SWB-2, which has a depth to GW of 10 ft. So, we are assuming a depth to GW of 4ft at that location. BMP-2 (surface basin): No bedrock encountered. The shallowest depth to GW was 6 ft at SWB-3, and the proposed BMP elevations are above existing ground, so the depth to GW would be at least 6 ft. Grading plans for the BMPs have been attached to the response to comment log.
4.	The Applicant proposes temporary and permanent impacts to BLSF, LUWW, Riverfront Area, and Bank resource areas. The Commission may consider incorporating restoration plans, a monitoring period of at least 2 years, and 75% survival rate of planted vegetation as a special condition in the Order of Conditions, if approved, to be considered in compliance at the time of issuing a Certificate of Compliance.	The BLSF restoration area, and the overlapping resources of Bank, RFA, and buffer zone will be loamed and seeded with a native upland seed mix. It should be noted that Native seeding will be incorporated in areas of temporary disturbance to stabilize the area.

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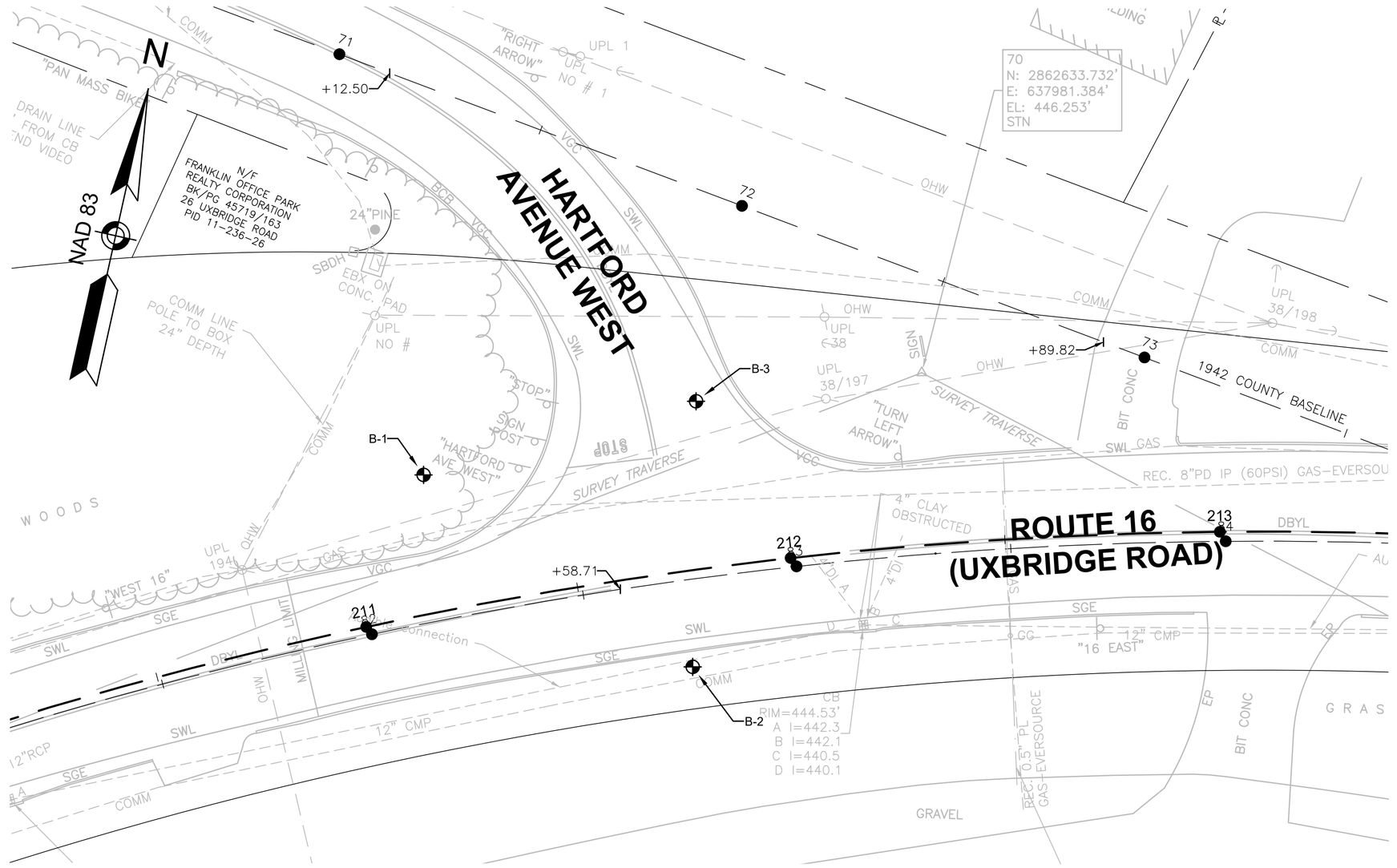
5.	The Applicant should confirm that there will be no impacts to BVW resource area, especially where the installation of concrete retaining walls at the inlet of Muddy Brook are proposed. The Commission may consider conditioning this work to occur during low-water or drawdown periods.	No BVW impacts will occur in relation to the work associated with Muddy Brook. Erosion controls will be placed in between the work and the resource area.
6.	The Applicant should implement and provide an Operations and Maintenance plan MassDEP and the Commission to demonstrate compliance with Standard 9. MassDEP recognizes that maintenance will likely consist of MassDOT's standard maintenance activities; however, a plan describing what the activities are, their frequency and annual cost should be provided in the review of the proposed project accordingly.	An Operations and Maintenance Plan will be incorporated into the Stormwater Pollution Prevention Plan (SWPPP). Upon request, this plan can be submitted to the Conservation Commission.
7.	An illicit discharge statement should be provided to MassDEP and the Commission to demonstrate compliance with Standard 10.	Please see the attached illicit discharge statement.
8.	Any conditions placed upon the project by NHESP as a result of the MESA review should be incorporated as special conditions in the Order of Conditions, if approved.	Per the NHESP determination dated August 22, 2024, NHESP has provided the following condition: Fisheries Protection: To minimize potential impacts to state listed fish, no work associated with the Muddy Brook culvert replacement portion of the project shall occur from April 1- May 31. If construction work is not finished by April 1 of a given year, the applicant shall provide the Division with a detailed hydraulic control plan to allow for fish passage to occur through the work area during April 1- May 31. The Division is available for consultation on this plan. MassDOT will comply with this condition.



OB-1 & SWB-2
SCALE 1" = 20'

0 20 50 100
SCALE: 1" = 20'

BORING LOCATION SCHEDULE					
BORING NO.	NORTHING	EASTING	STATION	OFFSET	SURFACE ELEV
OB-1	2,862,347'	637,505'	206+96	-54'LT	424.0'
SWB-2	2,862,383'	637,517'	207+29	-69'LT	425.4'



B-1, B-2, B-3
SCALE 1" = 20'

0 20 50 100
SCALE: 1" = 20'

BORING LOCATION SCHEDULE					
BORING NO.	NORTHING	EASTING	STATION	OFFSET	SURFACE ELEV
B-1	2,862,585'	637,873'	211+20	-32'LT	443.9'
B-2	2,862,555'	637,944'	211+74	22'RT	444.2'
B-3	2,862,616'	637,932'	211+83	-39'LT	445.9'

BORING NOTES

1. LOCATION OF BORINGS SHOWN AS: ⊕
2. EXPLORATIONS WERE CONDUCTED BY NORTHERN DRILL SERVICE, INC. (OF NORTHBOROUGH, MASSACHUSETTS) BETWEEN APRIL 25 TO MAY 04, 2022. BORINGS AND OBSERVATION WELLS WERE OBSERVED BY HNTB.
3. EXPLORATIONS ARE LOCATED FROM COORDINATES REFERENCED TO THE NORTH AMERICAN DATUM (NAD) OF 1983. EXPLORATION ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.
4. BORINGS TAKEN FOR THE PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTIONS.
5. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF EXPLORATION AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVELS, WHICH CAN FLUCTUATE SEASONALLY.
6. TWO (2) PLANNED CULVERT BORINGS DESIGNATED AS B-10 TO B-11 LOCATED IN PROXIMITIES OF THE EXISTING MUDDY BROOK CULVERT WERE DRILLED USING DRIVE-AND-WASH METHOD (D&W) TO DEPTHS CLOSE TO 34 TO 36 FEET BELOW GROUND SURFACE (BGS), INCLUDING ROCK CORES.
7. FIVE (5) PLANNED STORMWATER BORINGS, DESIGNATED AS SWB-2 TO SWB-6, WERE MAINLY DRILLED DRY AS DEEP AS POSSIBLE AND THEN AS D&W BORINGS TO DEPTHS CLOSE TO 8.0 TO 16.0 FEET BGS, FOR THE PURPOSE OF SOIL IDENTIFICATION FOR STORMWATER DESIGN. SWB-1 WAS ELIMINATED AS IT WAS LOCATED IN A LARGE FIELD OF POISON IVY.
8. THREE (3) OBSERVATION WELLS, DESIGNATED AS OB-1 TO OB-3, WERE DRILLED AS A 4-INCH BOREHOLE AND INSTALLED TO DEPTHS CLOSE TO 15.0 TO 21.0 FEET BGS, WITH A 2-INCH WELL SCREEN AND PVC RISER AND COVER.
9. NINE (9) PLANNED TRAFFIC OR HIGHWAY BORINGS DESIGNATED AS B-1 TO B-9 LOCATED ALONG ROUTE 16 WERE DRILLED USING D&W TO DEPTHS CLOSE TO 9.8 TO 16.0 FEET BELOW GROUND SURFACE (BGS), INCLUDING ROCK CORES.
10. IN GENERAL, CONTINUOUS SAMPLING WAS PERFORMED THROUGHOUT THE TOP 10 FEET AND AT 5-FOOT INTERVALS THEREAFTER.
11. STANDARD PENETRATION TESTS WERE MADE AND SPLIT SPOON SAMPLES COLLECTED USING AN AUTOMATIC HAMMER. SPLIT SPOONS WERE DRIVEN A DISTANCE OF 24 INCHES, UNLESS PRACTICAL REFUSAL WAS ENCOUNTERED. ROCK CORES WERE OBTAINED USING A 2.15-INCH ID CORE BIT.

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	116
PROJECT FILE NO.		608491	

AS-DRILLED BORING PLANS
SHEET 1 OF 3

608491_GT1(BORINGPLAN).DWG Plotted on 3-Nov-2022 2:29 PM

Proposal No. 608491-131468

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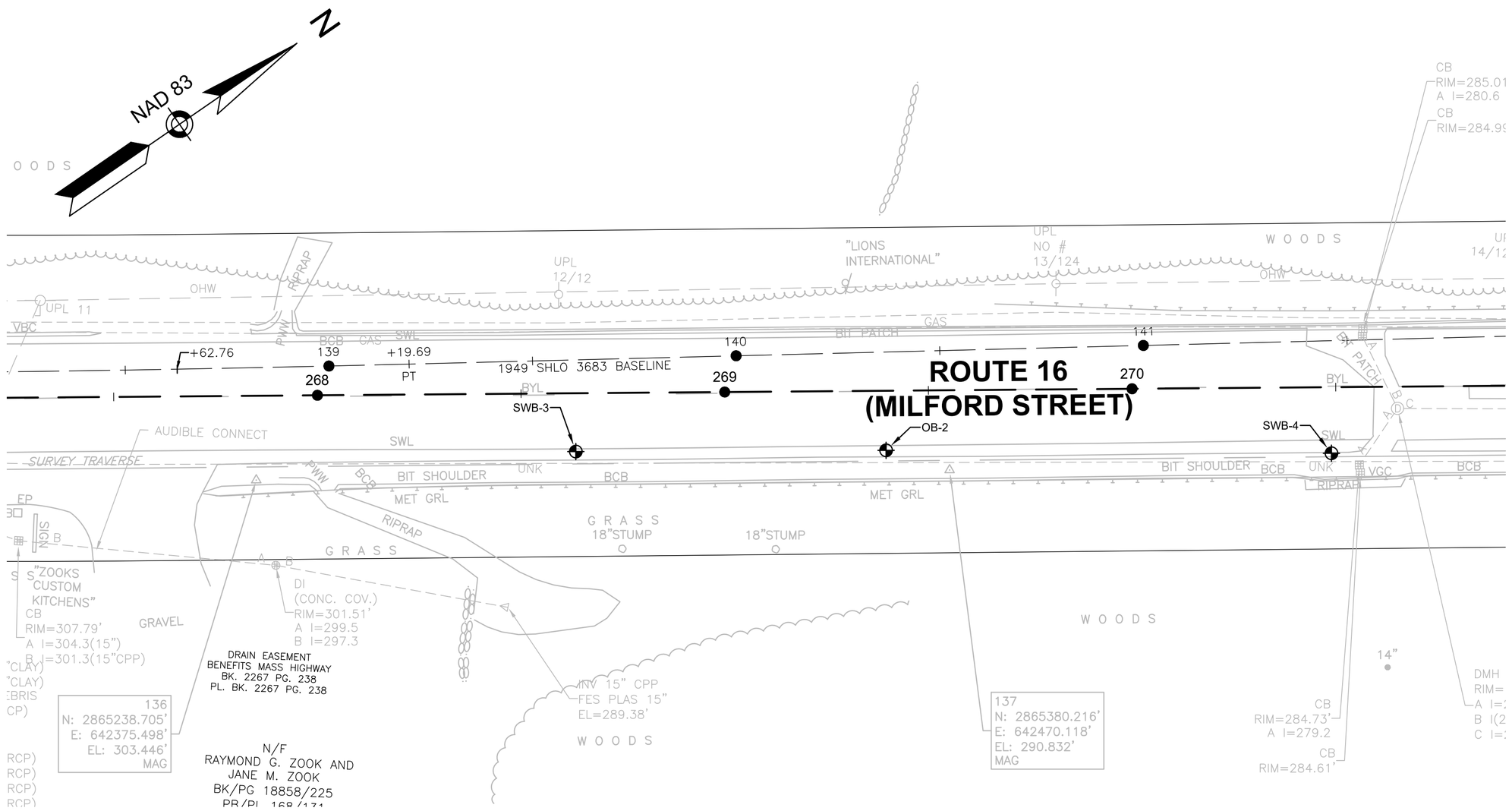
MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	116
PROJECT FILE NO.	608491		

AS-DRILLED BORING PLANS
SHEET 3 OF 3

608491_GT1(BORINGPLAN).DWG Plotted on 3-Nov-2022 2:30 PM

Proposal No. 608491-131468

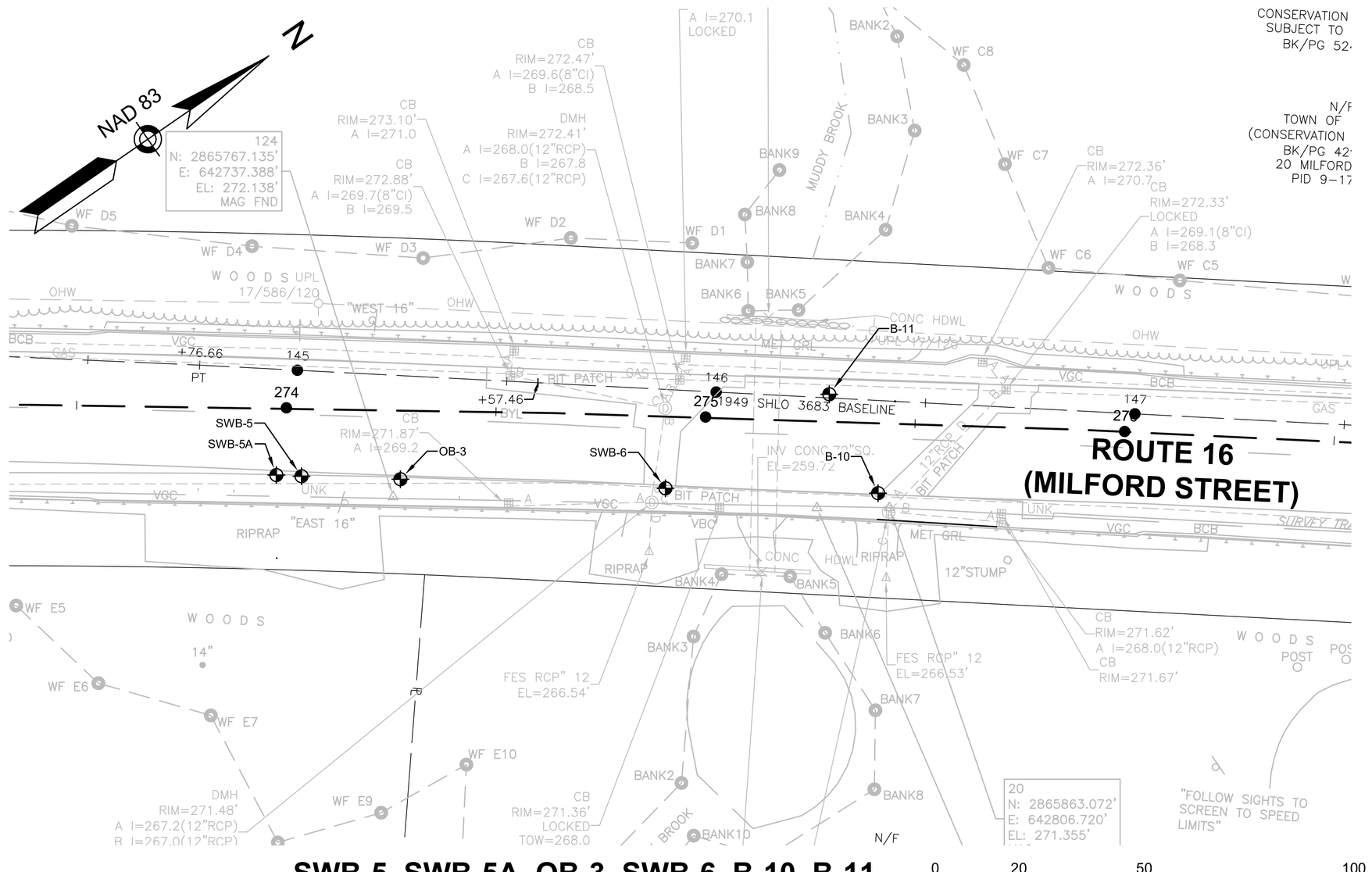


SWB-3, OB-2, SWB-4
SCALE 1" = 20'

0 20 50 100
SCALE: 1" = 20'

BORING LOCATION SCHEDULE					
BORING NO.	NORTHING	EASTING	STATION	OFFSET	SURFACE ELEV
OB-2	2,865,370'	642,457'	269+40	15'RT	292.1'
SWB-3	2,865,307'	642,414'	268+63	14'RT	297.6'
SWB-4	2,865,460'	642,520'	270+49	16'RT	285.3'

BORING LOCATION SCHEDULE					
BORING NO.	NORTHING	EASTING	STATION	OFFSET	SURFACE ELEV
B-10	2,865,863'	642,802'	275+42	17'RT	271.6'
B-11	2,865,867'	642,776'	275+29	-6'LT	272.3'
OB-3	2,865,771'	642,735'	274+28	17'RT	272.2'
SWB-5	2,865,752'	642,721'	274+04	16'RT	272.4'
SWB-5A	2,865,747'	642,717'	273+98	16'RT	272.6'
SWB-6	2,865,822'	642,773'	274+91	17'RT	271.6'



SWB-5, SWB-5A, OB-3, SWB-6, B-10, B-11
SCALE 1" = 20'

0 20 50 100
SCALE: 1" = 20'

A00860 - 292

Northern Drill Service, Inc

130 East Main Street, Northborough, Massachusetts, 01532

No. B-1

Scale: 1:20

City/Town: Mendon	Bridge Number:	Project File Number: 608491	Page 1 of 1
Location: Rte. 16 & Hartford Ave.		Date & Time Started: 4/27/2022 7:15 AM	Total Hours: 1.3
Groundwater Depth (Feet): 8	Date & Time: 4/27/22 8:30 AM	Date & Time Completed: 4/27/2022 8:30 AM	
Coordinates (Feet): N 2862585 E 637873		Driller's Name: Z. Nadar	Helper's Name: J. Stevens
Ground Elevation (Feet): 443.9	Inspector's Name (PRINT): M. Jimenez	Inspector's Signature: M. Jimenez	Inspector's Company: HNTB

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches / Coring Times Minutes per Foot	Recovery (inches)	Field Description	Strata Changes
SS - 1	0 - 2	1 - 4 - 9 - 13	18	***0.0 - 0.3'*** - Top soil. ***0.3*** - SS-1: First 4 inches of recovery are top soil. Moist, medium dense, orange, brown, gray, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel (FILL).	444
SS - 2	2 - 4	18 - 19 - 26 - 29	20	***2.0*** - SS-2: Moist, dense, gray, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.	
SS - 3	4 - 6	13 - 22 - 17 - 19	17	***4.0*** - SS-3: Moist, dense, gray, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.	5 439
SS - 4	6 - 8	24 - 18 - 35 - 26	15	***6.0*** - SS-4: Moist, very dense, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.	
SS - 5	8 - 10	11 - 24 - 21 - 29	15	***8.0*** - SS-5: Moist, dense, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.	10 434
SS - 6	14 - 16	30 - 33 - 38 - 30	22	***14.0*** - SS-6: Wet, very dense, FINE TO COARSE SAND, some inorganic silt, trace fine gravel.	15 429
				16.0 - Boring terminated at 16 feet below ground surface.	

Remarks: Boring moved due to trees blocking access. GW reading elevation shows moist sample. Last sample is wet.

Arrow-Board: -
Signs: -
Cones: -

Protective Device - Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Penetration Resistance (N) Guide

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N = Sum of Second and Third 6" Blow Counts

Terms Used for Second Entry of Descriptions: and = 35-50%, some = 12-35%, little = 5-12%, trace = 5% or less

Type of Drill Rig: Mobile B-59

Casing Type: Steel Size 4"
Hammer Weight: 140 lb
Fall: 30"
Depth: 16

Sampler Type: SS Size 1-3/8" ID
Automatic Hammer Weight: 140 lb
Safety Hammer Weight: -
Donut Hammer Weight: -
Fall: 30"

Core Barrel Type: Size: 2.15" ID

Northern Drill Service, Inc

130 East Main Street, Northborough, Massachusetts, 01532

No. OB-1

Scale: 1:20

City/Town: Mendon	Bridge Number:	Project File Number: 608491	Page 1 of 1
Location: South Rte. 16 wood area		Date & Time Started: 4/26/2022 11:45 AM	Total Hours: 1
Groundwater Depth (Feet): 6	Date & Time: 4/26/22 12:45 PM	Date & Time Completed: 4/26/2022 12:45 PM	
Coordinates (Feet): N 2862347 E 637505		Driller's Name: Z. Nader	Helper's Name: J. Stevens
Ground Elevation (Feet): 424	Inspector's Name (PRINT): M. Jimenez	Inspector's Signature: M. Jimenez	Inspector's Company: HNTB

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches / Coring Times Minutes per Foot	Recovery (inches)	Field Description	Strata Changes
SS - 1	0 - 2	3 - 4 - 14 - 20	17	***0.0*** - SS-1: First 3 inches of recovery are top soil. Rest of recovery: dry, medium dense, dark brown, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt.	424
SS - 2	2 - 4	16 - 23 - 9 - 7	7	***2.0*** - SS-2: Dry, dense, brown, gray, FINE TO COARSE SAND, some fine to medium gravel. Last 2 inches of recovery: light brown, FINE TO COARSE SAND, some inorganic silt.	
SS - 3	4 - 6	4 - 3 - 3 - 2	6	***4.3*** - SS-3A First 3 inches of recovery are dry, medium stiff, dark brown, INORGANIC SILT, some fine sand, trace roots. ***4.3*** - SS-3B Rest of recovery: moist to wet, loose, brown, FINE TO COARSE SAND AND INORGANIC SILT.	5 419
SS - 4	6 - 8	5 - 19 - 16 - 12	0	***6.0*** - SS-4: No Recovery.	
SS - 5	8 - 9.75	16 - 16 - 30 - 50/3"	13	***8.0*** - SS-5: Wet, dense, light brown, FINE TO COARSE SAND, some inorganic silt.	10 414
SS - 6	14 - 14.3	50/3" - - -		***14.0*** - No Recovery. Advanced roller bit to 15 feet.	
				15.0 - Boring terminated at 15.2 feet below ground surface.	15 409

Remarks: Monitoring well installed. See monitoring well log for details.

Arrow-Board: -
Signs: -
Cones: -

Protective Device - Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Penetration Resistance (N) Guide

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N = Sum of Second and Third 6" Blow Counts

Terms Used for Second Entry of Descriptions: and = 35-50%, some = 12-35%, little = 5-12%, trace = 5% or less

Type of Drill Rig: Mobile B-59

Casing Type: Steel Size 4"
Hammer Weight: 140 lb
Fall: 30"
Depth: 15

Sampler Type: SS Size 1-3/8" ID
Automatic Hammer Weight: 140 lb
Safety Hammer Weight: -
Donut Hammer Weight: -
Fall: 30"

Core Barrel Type: Size: 2.15" ID

Northern Drill Service, Inc

130 East Main Street, Northborough, Massachusetts, 01532

No. SWB-2

Scale: 1:20

City/Town: Mendon	Bridge Number:	Project File Number: 608491	Page 1 of 1
Location: South Rte. 16 wood area		Date & Time Started: 4/26/2022 9:35 AM	Total Hours: 1.6
Groundwater Depth (Feet): 10	Date & Time: 4/26/22 11:10 AM	Date & Time Completed: 4/26/2022 11:10 AM	
Coordinates (Feet): N 2862383 E 637517		Driller's Name: Z. Nader	Helper's Name: J. Stevens
Ground Elevation (Feet): 425.4	Inspector's Name (PRINT): M. Jimenez	Inspector's Signature: M. Jimenez	Inspector's Company: HNTB

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches / Coring Times Minutes per Foot	Recovery (inches)	Field Description	Strata Changes
SS - 1	0 - 2	20 - 19 - 24 - 25	6	***0.0*** - SS-1: Dry, dense, dark brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace organic silt, trace roots, trace wood (TOP SOIL).	425
SS - 2	2 - 4	9 - 24 - 25 - 24	5	***2.0*** - SS-2: Dry, dense, dark brown, FINE TO COARSE SAND AND FINE TO MEDIUM GRAVEL, little organic silt, trace roots (TOP SOIL).	
SS - 3	4 - 6	7 - 10 - 16 - 59	13	***4.0*** - SS-3: Dry, medium dense, light brown, orange, FINE SAND AND FINE TO COARSE GRAVEL, some inorganic silt.	5 420
SS - 4	6 - 7.3	39 - 59 - 50/3" -	12	***6.0*** - SS-4: Dry, very dense, light brown, orange, FINE SAND AND FINE TO COARSE GRAVEL, some inorganic silt.	
SS - 5	10 - 10.8	40 - 50/3" - -	4	***10.0*** - SS-5: Wet, very dense, light brown, orange, FINE SAND AND FINE TO MEDIUM GRAVEL, some inorganic silt. Rolled bit through hard rock (possible boulder).	10 415
				11.0 - Boring terminated at 11 feet below groud surface.	15 410

Remarks:

Arrow-Board: -
Signs: -
Cones: -

Protective Device - Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Penetration Resistance (N) Guide

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N = Sum of Second and Third 6" Blow Counts

Terms Used for Second Entry of Descriptions: and = 35-50%, some = 12-35%, little = 5-12%, trace = 5% or less

Type of Drill Rig: Mobile B-59

Casing Type: Steel Size 4"
Hammer Weight: 140 lb
Fall: 30"
Depth: 11

Sampler Type: SS Size 1-3/8" ID
Automatic Hammer Weight: 140 lb
Safety Hammer Weight: -
Donut Hammer Weight: -
Fall: 30"

Core Barrel Type: Size: 2.15" ID

Northern Drill Service, Inc

130 East Main Street, Northborough, Massachusetts, 01532

No. OB-2

Scale: 1:20

City/Town: Mendon	Bridge Number:	Project File Number: 608491	Page 1 of 2
Location: North Rte. 16		Date & Time Started: 5/2/2022 11:00 AM	Total Hours: 2
Groundwater Depth (Feet): 19	Date & Time: 5/2/22 12:15 PM	Date & Time Completed: 5/2/2022 1:00 PM	
Coordinates (Feet): N 2865370 E 642457		Driller's Name: Z. Nader	Helper's Name: D. McGown
Ground Elevation (Feet): 292.1	Inspector's Name (PRINT): M. Jimenez	Inspector's Signature: M. Jimenez	Inspector's Company: HNTB

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches / Coring Times Minutes per Foot	Recovery (inches)	Field Description	Strata Changes
				0.0 - Drilled through asphalt.	292
SS - 1	0.5 - 2	N.A. - 17 - 15 - 38	11	***0.5*** - SS-1: First 2 inches of recovery show asphalt. Moist, very dense, brown to gray, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace inorganic silt. 2 inches asphalt.	
SS - 2	2 - 4	11 - 25 - 27 - 32	12	***2.0*** - SS-2: Moist, very dense, brown to gray, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace inorganic silt.. Last 4 inches of recovery show cobble fragments.	
SS - 3	4 - 6	7 - 7 - 6 - 3	2	***4.0*** - SS-3: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, little inorganic silt.	5 / 287
SS - 4	6 - 8	4 - 2 - 2 - 3	8	***6.0*** - SS-4: Moist, very loose, brown, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt.	
SS - 5	8 - 10	3 - 2 - 2 - 3	0	***8.0*** - SS-5: No recovery.	10 / 282
SS - 6	14 - 14.6	25 - 50/2" - -	0	***14.0*** - SS-6: No recovery.	15 / 277
				16.0 - Wobbly advance of rolled bit through hard soil with rock.	
SS - 7	19 - 21	13 - 20 - 37 - 56	14	***19.0*** - SS-7: Wet, very dense, brown to orange-brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, some inorganic silt.	

Remarks: Boring moved due to access with steep slope. Monitoring well installed. See monitoring well log for details.

Arrow-Board: -
Signs: -
Cones: -

Protective Device - Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Penetration Resistance (N) Guide

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N = Sum of Second and Third 6" Blow Counts

Terms Used for Second Entry of Descriptions: and = 35-50%, some = 12-35%, little = 5-12%, trace = 5% or less

Type of Drill Rig: Mobile B-59

Casing Type: Steel Size 4"
Hammer Weight: 140 lb
Fall: 30"
Depth: 20

Sampler Type: SS Size 1-3/8" ID
Automatic Hammer Weight: 140 lb
Safety Hammer Weight: -
Donut Hammer Weight: -
Fall: 30"

Core Barrel Type: Size: 2.15" ID

Northern Drill Service, Inc

130 East Main Street, Northborough, Massachusetts, 01532

No. SWB-3

Scale: 1:20

City/Town: Mendon	Bridge Number:	Project File Number: 608491	Page 1 of 1
Location: North Rte. 16		Date & Time Started: 5/2/2022 9:10 AM	Total Hours: 1.6
Groundwater Depth (Feet): 6	Date & Time: 5/2/22 9:50 AM	Date & Time Completed: 5/2/2022 10:45 AM	
Coordinates (Feet): N 2865307 E 642414		Driller's Name: Z. Nader	Helper's Name: T. Kenedy
Ground Elevation (Feet): 297.6	Inspector's Name (PRINT): M. Jimenez	Inspector's Signature: M. Jimenez	Inspector's Company: HNTB

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches / Coring Times Minutes per Foot	Recovery (inches)	Field Description	Strata Changes
				0.0 - Drilled through asphalt.	298
SS - 1	0.5 - 2	N.A. - 12 - 25 - 55	9	***0.5*** - SS-1: First 3 inches of recovery are asphalt. Rest of recovery : moist, very dense, dark brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, little inorganic silt. Tip of spoon shows fragments of cobble.	
SS - 2	2 - 4	13 - 22 - 17 - 18	11	***2.0*** - SS-2: Moist, dense, dark brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, little inorganic silt.	
SS - 3	4 - 6	7 - 2 - WOH - 2	8	***4.0*** - SS-3: Mosit, very soft, dark brown, INORGANIC SILT AND FINE TO COARSE SAND, little fine to coarse gravel.	5 / 293
SS - 4	6 - 8	4 - 4 - 5 - 15	8	***6.0*** - SS-4: Wet, loose, orange, brown, FINE TO COARSE SAND, some fine to coarse gravel, some inorganic silt.	
SS - 5	8 - 10	21 - 36 - 43 - 60	9	***8.0*** - SS-5: Wet, very dense, brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, some inorganic silt.	10 / 288
SS - 6	14 - 16	10 - 11 - 16 - 35	0	***14.0*** - SS-6: No recovery. Wash shows same as above.	15 / 283
				16.0 - Boring terminated at 16 feet below ground surface.	

Remarks: Boring moved due to access with steep slope.

Arrow-Board: -
Signs: -
Cones: -

Protective Device - Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Penetration Resistance (N) Guide

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N = Sum of Second and Third 6" Blow Counts

Terms Used for Second Entry of Descriptions: and = 35-50%, some = 12-35%, little = 5-12%, trace = 5% or less

Type of Drill Rig: Mobile B-59

Casing Type: Steel Size 4"
Hammer Weight: 140 lb
Fall: 30"
Depth: 15

Sampler Type: SS Size 1-3/8" ID
Automatic Hammer Weight: 140 lb
Safety Hammer Weight: -
Donut Hammer Weight: -
Fall: 30"

Core Barrel Type: Size: 2.15" ID

Northern Drill Service, Inc

130 East Main Street, Northborough, Massachusetts, 01532

No. SWB-4

Scale: 1:20

City/Town: Mendon	Bridge Number:	Project File Number: 608491	Page 1 of 1
Location: North Rte. 16		Date & Time Started: 5/2/2022 2:00 PM	Total Hours: 1
Groundwater Depth (Feet): 8	Date & Time: 5/2/22 2:30 PM	Date & Time Completed: 5/2/2022 3:00 PM	
Coordinates (Feet): N 2865460 E 642520		Driller's Name: N. Nader	Helper's Name: D. McGown
Ground Elevation (Feet): 285.3	Inspector's Name (PRINT): M. Jimenez	Inspector's Signature: M. Jimenez	Inspector's Company: HNTB

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches / Coring Times Minutes per Foot	Recovery (inches)	Field Description	Strata Changes
					285
SS - 1	0.5 - 2	N.A. - 13 - 16 - 25	6	***0.5*** - Drilled through asphalt. ***0.5*** - SS-1: Moist, dense, brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, little inorganic silt.	
SS - 2	2 - 3.25	7 - 25 - 50/3" -	3	***2.0*** - SS-2: Moist, very dense, brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, little inorganic silt.	
SS - 3	4 - 6	11 - 15 - 7 - 4	1	***4.0*** - SS-3: Wet, medium dense, brown, trace orange, FINE TO COARSE SAND, some medium to fine gravel, some inorganic silt.	5 280
SS - 4	6 - 8	7 - 4 - 2 - 5	1	***6.0*** - SS-4: Wet, loose, brown, brown, trace orange, FINE TO COARSE SAND, some medium to fine gravel, some inorganic silt.	
SS - 5	8 - 10	1 - 1 - 1 - 2	17	***8.0*** - SS-5A: Half recovery: moist, soft, dark brown to light brown, INORGANC SILT AND FINE SAND, trace medium to fine gravel. ***9.0*** - SS-5B: Half recovery: wet, soft, light brown, INORGANIC SILT, some fine sand, trace medium to fine gravel.	10 275
SS - 6	14 - 16	9 - 23 - 39 - 57	16	***14.0*** - SS-6: Wet, very dense, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace inorganic silt.	15 270
				16.0 - Boring terminated at 16 feet below ground surface.	

Remarks: Boring moved due to access with steep slope.

Arrow-Board: -
Signs: -
Cones: -

Protective Device - Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Penetration Resistance (N) Guide

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N = Sum of Second and Third 6" Blow Counts

Terms Used for Second Entry of Descriptions: and = 35-50%, some = 12-35%, little = 5-12%, trace = 5% or less

Type of Drill Rig: Mobile B-59

Casing Type: Steel Size 4"
Hammer Weight: 140 lb
Fall: 30"
Depth: 15

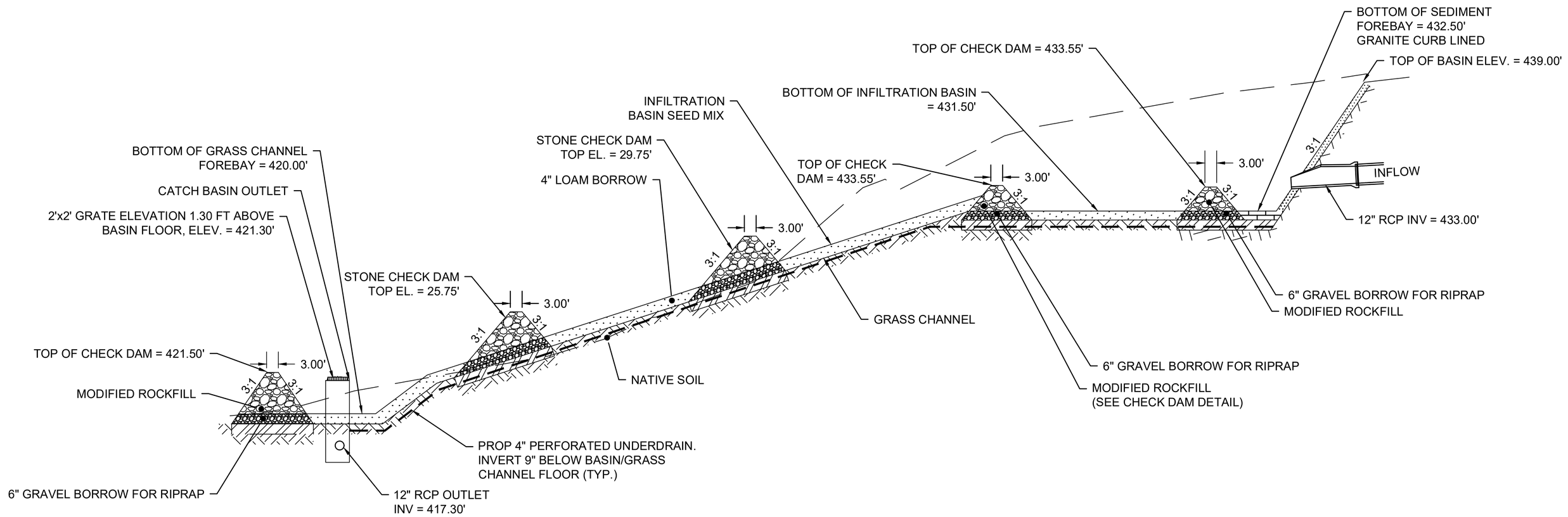
Sampler Type: SS Size 1-3/8" ID
Automatic Hammer Weight: 140 lb
Safety Hammer Weight: -
Donut Hammer Weight: -
Fall: 30"

Core Barrel Type: Size: 2.15" ID

MENDON
ROUTE 16

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	188	311
PROJECT FILE NO.	608491		

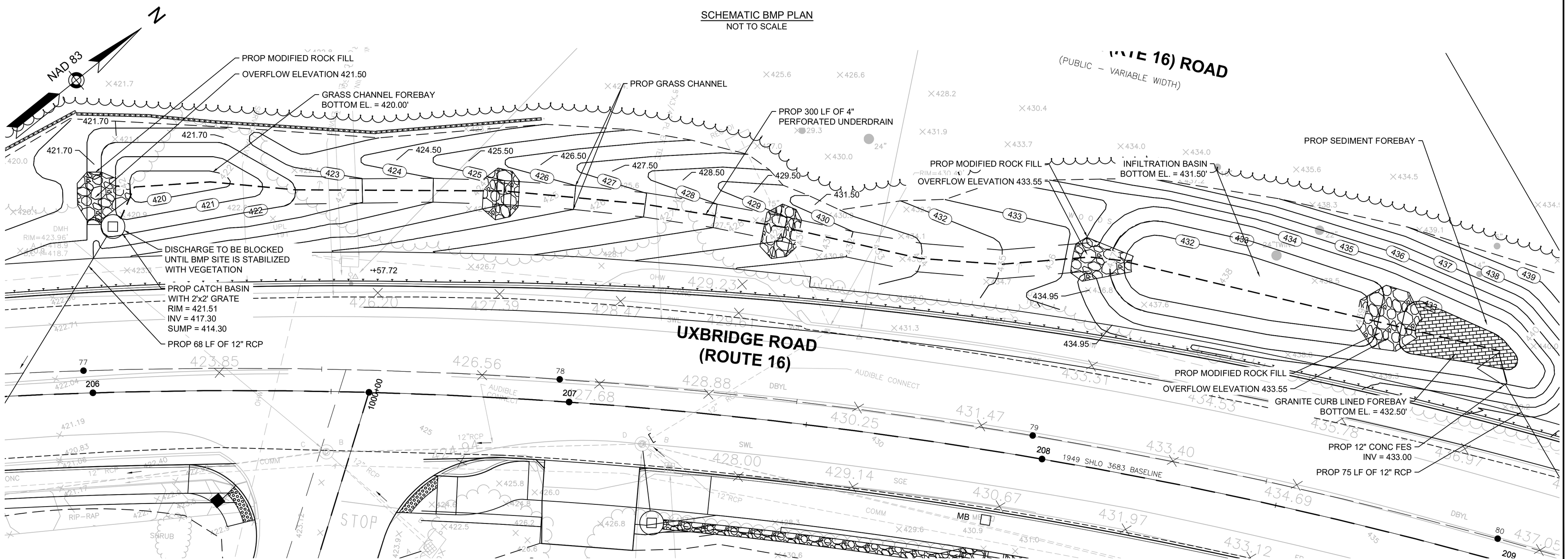
DRAINAGE DETAILS
SHEET 5 OF 6



SCHEMATIC BMP PLAN
NOT TO SCALE

DRAINAGE NOTES:

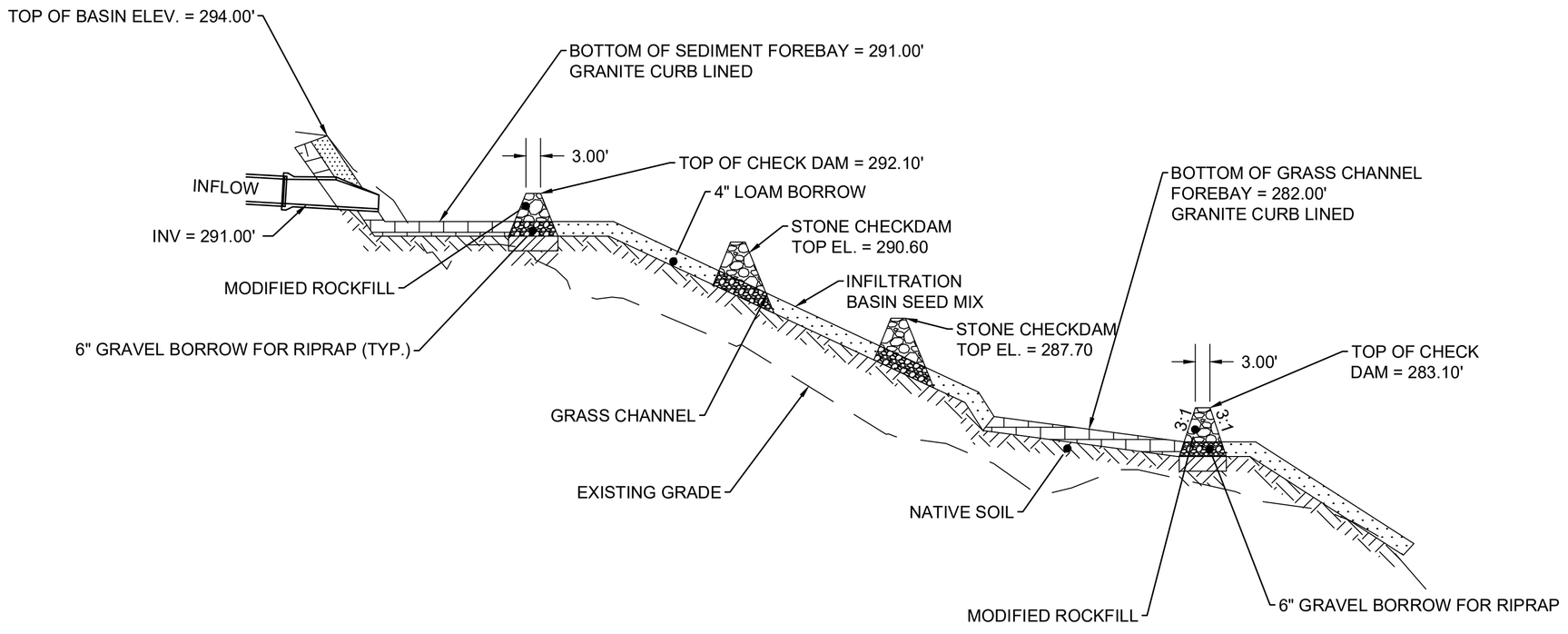
1. DURING CONSTRUCTION, USE A REMOVABLE MECHANICAL PLUG TO BLOCK FLOW TO THE FLARED END SECTION DISCHARGE TO THE FOREBAY. ONCE PROJECT CONSTRUCTION IS COMPLETE AND THE PROPOSED INFILTRATION BASINS ARE STABILIZED AND VEGETATED, MOVE THE PLUG TO BLOCK FLOW TO PROPOSED DMH 102.



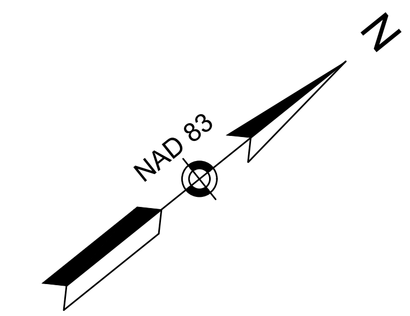
MENDON
ROUTE 16

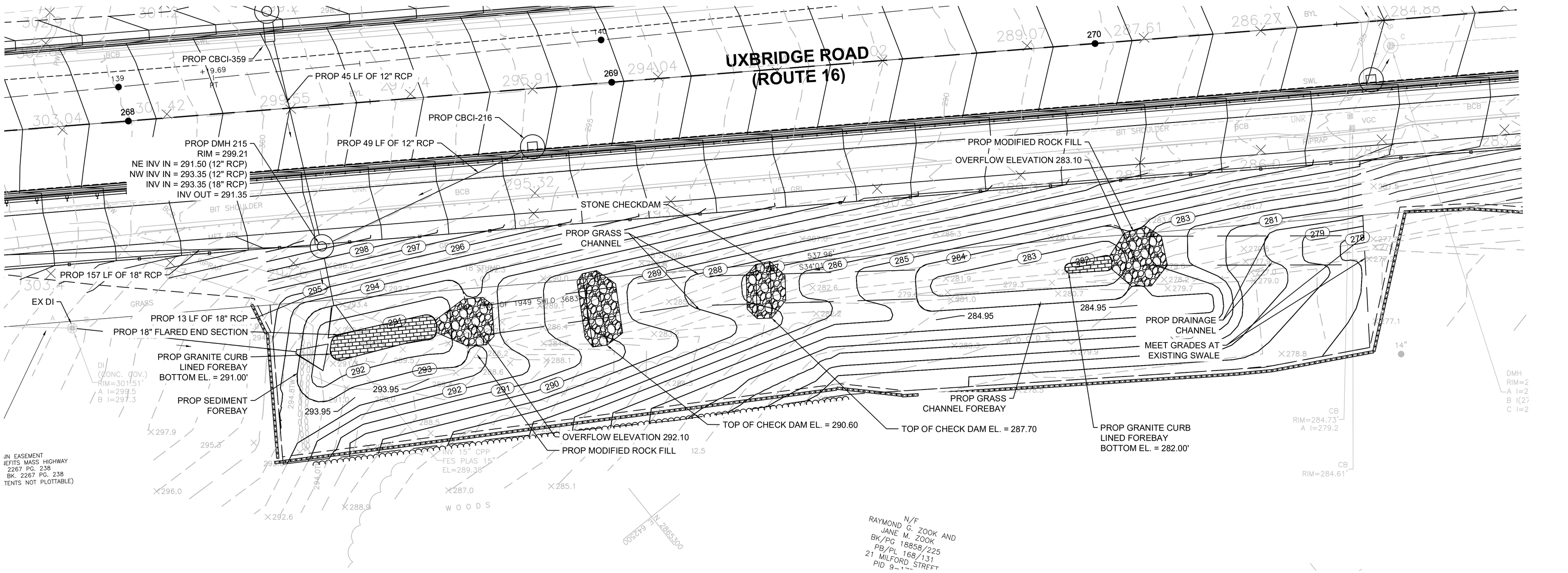
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	189	311
PROJECT FILE NO.		608491	

DRAINAGE DETAILS
SHEET 6 OF 6



SCHEMATIC BMP PLAN
NOT TO SCALE





608491_UT3(DRAINAGE DETAILS).DWG Plotted on 22-Aug-2024 11:21 AM

Proposal No. 608491-131468

A00660 - 300

ILLICIT DISCHARGE COMPLIANCE STATEMENT

SITE ADDRESS: UXBRIDGE ROAD (ROUTE 16)

OWNER: MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

PLAN REFERENCE: PLAN SET PREPARED BY HNTB CORP

DATE: September 3, 2024

As required by Standard 10 of the Massachusetts Stormwater Standards, I, the undersigned, being the authorized owner/responsible party of the above referenced property do hereby certify that no illicit discharges exist on the site and that the stormwater management system, as shown on the above referenced plan, does not contain or permit any illicit discharges to enter the stormwater management system. Furthermore, discharges from interior building drains or plumbing within the buildings are prohibited. Illicit discharges do not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

The pollution prevention plan measures to implements in this project to prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease, include:

1. Identifying the responsible personnel for the implementation of an effective Illicit Discharge Detection and Elimination [IDDE] program.
2. Identify potential sources of Illicit Discharges.
3. Implement the Spill Prevention and Control Plan contained in the property Stormwater Pollution Prevention Plan [SWPPP].

Further, I certify that the stormwater management system as shown on the referenced plan will be maintained in accordance with the conditions of the Long Term Pollution Prevention Plan.

NAME: Will Schreefer

SIGNED: William Schreefer

DATE: September 3, 2024

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DOCUMENT A00861

MASSACHUSETTS

DEPARTMENT OF ENVIRONMENTAL PROTECTION

ORDER OF CONDITIONS

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Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
218-0853
MassDEP File #

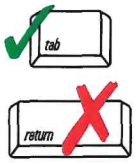
eDEP Transaction #

Mendon
City/Town

A. General Information

Please note: this form has been modified with added space to accommodate the Registry of Deeds Requirements

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



1. From: Mendon
Conservation Commission

2. This issuance is for (check one): a. ☒ Order of Conditions b. ☐ Amended Order of Conditions

3. To: Applicant:

Erica
a. First Name

Larner
b. Last Name

Massachusetts Department of Transportation - Highway Division
c. Organization

10 Plark Plaza Room 7360
d. Mailing Address

Boston
e. City/Town

MA
f. State

02116
g. Zip Code

4. Property Owner (if different from applicant):

a. First Name

b. Last Name

Massachusetts Department of Transportation - Highway Division
c. Organization

10 Park Plaza
d. Mailing Address

Boston
e. City/Town

MA
f. State

02116
g. Zip Code

5. Project Location:

Route 16 (Uxbridge Rd)
a. Street Address

Mendon
b. City/Town

roadway
c. Assessors Map/Plat Number

roadway
d. Parcel/Lot Number

Latitude and Longitude, if known: 42.107782d m s - 71.553568d m

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
218-0853
MassDEP File #

eDEP Transaction #

Mendon
City/Town

A. General Information (cont.)

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):
NA Roadway
a. County | b. Certificate Number (if registered land)
c. Book | d. Page

7. Dates: 7/31/2024 a. Date Notice of Intent Filed | 9/12/2024 b. Date Public Hearing Closed | 9/23/2024 c. Date of Issuance

8. **Final Approved Plans and Other Documents (attach additional plan or document references as needed):**
Massachusetts DOT Highway Division Uxbridge Road, Hastings St, Milford St (Route 16)
a. Plan Title
HNTB COrporation
b. Prepared By
James Barnack 7/10/2024
c. Signed and Stamped by
2/23/2024
d. Final Revision Date
1"=20'
e. Scale
f. Additional Plan or Document Title | g. Date

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

a. ☒ **Public Water Supply** b. ☐ **Land Containing Shellfish** c. ☒ **Prevention of Pollution**
d. ☒ **Private Water Supply** e. ☒ **Fisheries** f. ☒ **Protection of Wildlife Habitat**
g. ☒ **Groundwater Supply** h. ☒ **Storm Damage Prevention** i. ☒ **Flood Control**

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

a. ☒ **the following conditions which are necessary in accordance with the performance** standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
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B. Findings (cont.)

Denied because:

b. ☐ the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. ☐ the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. ☐ Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) — a. linear feet

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. ☒ Bank	35LF (temp) a. linear feet	35LF b. linear feet	0 c. linear feet	0 d. linear feet
5. ☐ Bordering Vegetated Wetland	a. square feet	b. square feet	c. square feet	d. square feet
6. ☒ Land Under Waterbodies and Waterways	90 sf (temp) a. square feet	90 sf b. square feet	0 c. square feet	0 d. square feet
	0 e. c/y dredged	f. c/y dredged		
7. ☒ Bordering Land Subject to Flooding	90 sf (temp) 503 sf (per)	90 sf temp 503 sf perm	34.32 c. square feet	34.32 d. square feet
Cubic Feet Flood Storage	36.95 cf e. cubic feet	36.95 cf f. cubic feet	148.28 g. cubic feet	148.28 h. cubic feet
8. ☐ Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. ☒ Riverfront Area	15380P 981T a. total sq. feet	15380P 981T b. total sq. feet		
Sq ft within 100 ft	8, 828P 557T c. square feet	8, 828P 557T d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	6552P 421T g. square feet	6552P 421T h. square feet	i. square feet	j. square feet

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B. Findings (cont.)

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. ☐ Land Under the Ocean	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
12. ☐ Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. ☐ Coastal Beaches	a. square feet	b. square feet	c. nourishment cu yd	d. nourishment cu yd
14. ☐ Coastal Dunes	a. square feet	b. square feet	c. nourishment cu yd	d. nourishment cu yd
15. ☐ Coastal Banks	a. linear feet	b. linear feet		
16. ☐ Rocky Intertidal Shores	a. square feet	b. square feet		
17. ☐ Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18. ☐ Land Under Salt Ponds	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. ☐ Land Containing Shellfish	a. square feet	b. square feet	c. square feet	d. square feet
20. ☐ Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	a. c/y dredged	b. c/y dredged		
21. ☐ Land Subject to Coastal Storm Flowage	a. square feet	b. square feet		
22. ☐ Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet

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B. Findings (cont.)

* **#23.** If the project is for the purpose of restoring or enhancing a **wetland** resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23. ☐ Restoration/Enhancement *:

a. square feet of BVW | b. square feet of salt marsh

24. ☐ Stream Crossing(s):

a. number of new stream crossings | b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects.

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
   a. The work is a maintenance dredging project as provided for in the Act; or
   b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
   c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on 9/18/2024 unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.

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C. General Conditions Under Massachusetts Wetlands Protection Act

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.

9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.

10. A sign shall be displayed at the site not less then two square feet or more than three square feet in size bearing the words,

"Massachusetts Department of Environmental Protection" [or, "MassDEP"]

"File Number 218-0853 "

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.

12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.

13. The work shall conform to the plans and special conditions referenced in this order.

14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.

15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.

18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

19. The work associated with this Order (the "Project")
    (1) ☒ is subject to the Massachusetts Stormwater Standards
    (2) ☐ is NOT subject to the Massachusetts Stormwater Standards

    If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:

    a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.

    b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:
    i. all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;
    ii. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;
    iii. any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;

v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement) for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:

i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and

ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.

d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.

e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 19(f) through 19(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 19(f) through 19(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.

f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.

h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.

i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.

j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.

k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.

l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

See findings and special conditions

20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.

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D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? ☐ Yes ☒ No

2. The _____ hereby finds (check one that applies):
Conservation Commission

   a. ☐ that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:

   _____ _____
   1. Municipal Ordinance or Bylaw 2. Citation

   Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

   b. ☐ that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:

   _____ _____
   1. Municipal Ordinance or Bylaw 2. Citation

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.
   The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):

   Mass DOT is a state agency, exempt from Town of Mendon Wetlands Protection Bylaw Chapter 28.

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E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

9/23/24
1. Date of Issuance

Please indicate the number of members who will sign this form.
This Order must be signed by a majority of the Conservation Commission.

4
2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Signature — Carl Howard (Printed Name)

Signature — Lea Whitney (Printed Name)

Signature — Sara Charles (Printed Name)

Signature — Robert Sweet (Printed Name)

Signature — Printed Name

Signature — Printed Name

Signature — Printed Name

Signature — Printed Name

Signature — Printed Name

☐ by hand delivery on

Date

☑ by certified mail, return receipt requested, on 9/23/24

Date

Massachusetts Department of Environmental Protection
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F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

Findings and Special Conditions of the Mendon Conservation Commission
Route 16 Mass Department of Transporation – Highway Division
DEP #218-0853
Findings (considered as and given equal status as special conditions)

Site: Route 16 (Uxbridge Rd, Hastings St, Milford St) Mendon
Map/Pacel: NA (roadway)
Property: NA (roadway)

Owner: Mass Department of Transportation – Highway Division
Applicant: Erica Larner – Mass DOT – Highway Divison
Representative: Marissa Seifert, PWS
HNTB Corporation

Date of Issuance: September 23th, 2024

Approved Project Summary:

The approved project begins at Route 16 just west of Taft Avenue and continues east for 1.9 miles to the Hopedale Town line before Harrington Street. Project activities include pavement repair and resurfacing, bicycle and pedestrian accommodations, including a shared-use path, and reconstruction of the signalized intersections to include new traffic signal equipment and address issues from previous road safety audits. The project includes drainage improvements along the corridor, vegetaion clearing to improve sight distances and work on two existing culverts to accommodate the widening necessary fro the shared use path.

Alternatives analysis included no build, buffered bike lanes, and the share used path (preferred). No build is not an option, as Route 16 does not meet MassDOT's Healthy Transportation Directive. Buffered bike lanes on both sides of Route 16, separated only by a paint buffer, would result in a wider corridor and more weltand impact. The shared-use path have the off street corridor for both pedestrians and bicyclists, was chosen to have the greatest safety increase and least resource area impact.

Exemptions as minor activites in the buffer zone and Riverfront Area

- 310 CMR 10.02 (2)(b)(2.h) – installation of directly embedded utility poles
- 310 CMR 10.02 (2)(b)(2.i) – installation of underground utilities within the existing roadway
- 310 CMR 10.02 (2)(b)(2.o) – installation of signs
- 310 CMR 10.02 (2)(b)(2.p) – pavement resurfcating and reclamation

Limited Project Qualitifcation

- 310 CMR 10.53(3)(d) "the construction, reconstruction, operation and maintenance of underground and overhead public utilities, such as electrical distribution or transmission lines, or communication, sewer, water and natural gas lines;"
- 310 CMR 10.53(3)(f) "maintenance and improvement of existing public roadways, but limited to widening less than a single lane, adding shoulders, correcting substandard intersections, and improving inadequate drainage systems;"
- 310 CMR 10.53 (3)(i) "the maintenance, repair and improvement of structures, including dams and reservoirs and appurtenant works to such dams and reservoirs, buildings, piers, towers, headwalls, bridges, and culverts which existed on the effective date of April 1, 1983," and

Findings and Special Conditions of the Mendon Conservation Commission
Route 16 Mass Department of Transporation – Highway Division
DEP #218-0853

- 310 CMR 10.53 (3)(k) "the routine maintenance and repair of road drainage structures including culverts and catch basins, drainage easements, ditches, watercourses and artificial water conveyances to ensure flow capacities which existed on the effective date of April 1, 1983."

Resource Area Impacts:

Table 2. Impact Summary Table

WPA Resource Area	Temporary Impact (sf)	Permanent Impact (sf)	Total Impact (sf)
BLSF	90 sf	503 sf	593 sf
LUW	96 sf	0 sf	96 sf
Bank[1]	35 lf	0 lf	35 lf
100-foot Buffer Zone	2,896 sf	57,795 sf	60,691 sf
200-foot RFA	981 sf	15,380 sf	16,731 sf

Notes: 1. Bank provided in linear feet.

Table 3. Net Impacts to the 100-year Floodplain

Elevation	Cut (ft^3)	Fill (ft^3)	Net Loss (-)/Gain (+) to Flood Storage Capacity (ft^3)
262 - 263	36.80	6.64	+30.16
263 - 264	27.20	7.06	+20.14
264 - 265	32.08	7.75	+24.33
265 - 266	27.06	7.75	+19.31
266 - 267	25.14	7.75	+17.39
TOTAL	**148.28**	**36.95**	**+111.33**

Table 6. Performance Standard Thresholds for Wildlife Habitat Evaluations

Resource Area	Permissible Threshold	Area of Resource Present On-Site	Area of Permanent Alteration	Requires Wildlife Habitat Evaluation?
BLSF	10% or 5,000 sf (whichever is less)	37,403 ft^2	503 ft^2	No
Riverfront Area	No threshold. However, different review requirements apply depending on whether the Riverfront Area is undisturbed, previously developed, or if the activity is grandfathered or exempted from requirements for the Riverfront Area.	179,214 ft^2	15,380 ft^2	N/A
Bank	10% or 50 linear feet (whichever is less)	676 linear feet	0 linear feet	No
LUW	10% or 5,000 sf (whichever is less)	3,454 ft^2	0 ft^2	No

Findings and Special Conditions of the Mendon Conservation Commission
Route 16 Mass Department of Transporation – Highway Division
DEP #218-0853

Final Approved Plans:

Massachusetts Department of Transporatation Highway Division
Uxbridge Road, Hastings Street, Milford Street (Route 16)
In the Town of Mendon, Worcester County
Environmental Site Plans
Preprared by HNTB Corporation
Signed & Stamped by James T Barnack, PE, on July 10th, 2024
Revisions: 7/30/2021 – 25% Design Submission
3/17/2023 – 75% Design Submission
2/23/2024 – 100% Design Submission
Scale: 1"=20'

Plan Revisions:

- Any required or desired deviations from this plan shall be requested in writing of the Conservation Commission Office. Relatively minor changes which result in the same or decreased impact on the interests protected by the Act may be considered by the Commission for an amended Order of Conditions. If, however, the project purpose or scope changes substantially or the interests of the Wetlands Protection Act are not protected, the Commission will require the filing of a new Notice of Intent.
- When plans are updated, it is the responsibility of the applicant to provide all Town Departments involved in the permitting and approval process complete and consistent plans.
- The Mendon Conservation Commission retains the right to require the submittal of additional information or impose additional conditions deemed necessary to ensure the protection of wetland resource areas.

Jurisdiction:

- Bank and Mean Annual High Water line (MAHW): 310 CMR 10.54 & 10.58 (2)(a)(2)
- Bordering Vegetated Wetland (BVW) w/ 100' Buffer Zone: 310 CMR 10.55(4) & 310 CMR 10.53(1)
- Land Under Waterbodies and Waterways (LUWW): 310 CMR 10.56
- Bordering Land Subject to Flooding (BLSF): 310 CMR 10.57
- Riverfront Area (RA): 310 CMR 10.58

Special Conditions

Special conditions listed herein are pursuant to the Massachusetts Wetland Protection Act (MGL Chapter 131, Section 40), implementing Regulations (310 CMR 10.00).

Under Massachusetts Wetland Protection Act (MGL Chapter 131, Section 40), implementing Regulations (310 CMR 10.00)

Findings:

1) **Bank** has been identified as a resource area, subject to protection under the Wetland Protection Act and Regulations 310 CMR 10.54. Resource areas were flagged for Muddy Brook, Willow Brook, and an Unnamed stream. Bank has a 100-foot Buffer Zone. Bank is significant to the Interests of public and private water supply, protection of groundwater supply, flood control,

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storm damage prevention, prevention of pollution, protection of fisheries, and protection of wildlife habitat.
The Commission finds the project meets the performance standards.

2) **Bordering Vegetated Wetland (BVW)** has been identified as a resource area, subject to protection under the Wetland Protection Act and Regulations 310 CMR 10.55. BVW has a 100-foot Buffer Zone. BVW series HNTB A through J were flagged in the field, as shown on the approved plans. BVW is significant to the Interests of protection of public and private water supply, protection of groundwater supply, flood control, storm damage prevention, prevention of pollution, protection of fisheries, and protection of wildlife habitat.
No BVW alteration is proposed.

3) **Land Under Waterbodies and Waterways (LUWW)** has been identified as a resource area, subject to protection under the Wetland Protection Act and Regulations 310 CMR 10.56. LUWW consists of the land below the Muddy Brook, a perennial stream. LUWW is significant to the Interests of protection of public and private water supply, protection of groundwater supply, flood control, storm damage prevention, prevention of pollution, protection of fisheries, and protection of wildlife habitat.
The Commission finds the project meets the performance standards, although temporary impacts will occur to fisheries and widllfie habitat. This has been conditioned by NHESP.

4) **Bordering Land Subject to Flooding (BLSF)** has been identified as a Resource Area subject to protection under 310 CMR 10.57 as shown on the FEMA F.I.R.M. (Map No: 25027C1401). The Muddy Brook is mapped as a Zone AE. The Base Flood Elevation ranges from 267.0' on the upstream side of Muddy Brook, and 265.5' on the downstream side. BLSF is significant to the Interests of flood control, and storm damage prevention.
The Commission finds the work meets the performance standards.

5) **Riverfront Area** to Muddy Brook, a perennial stream has been identified through the identification of the boundary of Bank a resource area, subject to protection under the Wetland Protection Act and Regulations 310 CMR 10.58 as shown on the final approved plans. Riverfront Area is significant to the Interests of public and private water supply, protection of groundwater supply, flood control, storm damage prevention, prevention of pollution, protection of land containing shellfish and protection of wildlife habitat.
The Commission finds the proposed work meets the performance standards to the maximum extent possible. The project was approved for the performance standards it does not meet, as the project qualifies as a Limited Project under 310 CMR 10.53(3)(f).

6) **Mean Annual High Water Line** has been identified as a resource area, subject to protection under the Wetland Protection Act and Regulation 310 CMR 10.58 (2)(a)(2).

7) Resource areas were originally delineated by HNTB on August 7th, 11th, and October 1st, 2020. The boundaries were verified fro accuracy on October 4th, 2023. Changes to the resource boundaries during field verification were due to an inaccurate GPS unit. Resource area boundaries were updated to represent the true location. This was confirmed with the Commission on a site visit on August 8th, 2024.

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8) The property is located partially within Priority Habitat as designated by the Natural Heritage and Endangered Species Program (NHESP). NHESP has determined that the project, as proposed, will not adversely affect actual resource area of state protected wildlife under MA Wetland Protection Act. NHESP has determined that the project must be conditioned to avoid a take under MA Endangered Species Act. (NHESP file no. **24-18775**, dated August 22nd, 2024). Special conditions below.

9) The project will result in a net addition of approximately 1.53 acres (66,646 ft2) of impervious area. There are several structural BMPs proposed to improve qater quality, promote groundwater recharge, and enhance sediment removal within the drainage networks. The proposed BMPs are found to be an improvement to existing conditions.

10) The Commission held two public hearings for the project on
August 8th, 2024
September 12th, 2024

11) No other work besides what is described in the approved project summary is approved by this Order.

Special Conditions

12) This Order shall be included in all construction contracts, subcontracts, and specifications dealing with the work proposed and shall supersede any conflicting contract requirements. The applicant shall assure that all contractors, subcontractors, and personnel performing the permitted work are fully aware of the permit's terms and conditions.

13) Any material changes, alterations, or revisions to the project that could adversely impact any resource areas or the buffer zones to these resource areas not included in the referenced plans must be approved by the Commission prior to their implementation. Failure to comply with this condition may subject the Applicant to an Enforcement Order. If the Commission finds, by a majority vote, said changes to be significant and/or deviate from the project plans, Notice of Intent, or the Order of Conditions, then the Commission may require that the Applicant file a Request to Amend the Order of Conditions or a new Notice of Intent. Within 21-days of the close of said Public Hearing, the Commission will issue an Amended Order or new Order of Conditions.

14) The Conservation Commission members and Agent have the right to enter upon the land for the purpose of inspections and/or the taking of pictures prior to the issuance of a Certificate of Compliance. Times for the same will be at the discretion of the Commission.

15) A copy of the Final Approved Plans and the Order of Conditions shall be kept on-site at all times during construction.

16) All names, addresses, phone numbers and emergency phone numbers for all contractors shall be provided to the Conservation Commission.

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17) There shall not be any alteration of wetland vegetation or the buffer zone beyond the limit of work.

18) Prior to commencement of activities on the project site, the applicant shall complete the following:
   a) Sediment control measures shall be properly installed;
   b) Proof of **recording** of the Order of Conditions at the Registry of Deeds shall be submitted;
   c) Submit the draft **Storm Water Pollution Prevention Plan (SWPPP)** on the EPA template not less than 45 days prior to anticipated commencement of work;
   d) Submit the signed pages/appendices to the **Storm Water Pollution Prevention Plan (SWPPP)** and the qualified inspector's Certificate of EPA Construction General Permit training or equivalent, required under EPA's NPDES permit requirements;
   e) A **mandatory preconstruction meeting** shall take place between the applicant/owner, contractor, subcontractors and the Conservation Agent; each attendee shall bring a copy of the recorded OOC to the meeting. Erosion and sediment controls shall be reviewed.

19) Upon completion of all proposed and approved work the owner/applicant shall complete the following:
   a) Ensure all disturbed areas have been stabilized with loam and seed and mowed at least twice;
   b) Planting and final vegetative stabilization by two growing seasons of the buffer zone and Riverfront Areas;
   c) Remove all sediment controls;
   d) Submit a completed **Request for a Certificate of Compliance (DEP form WPA Form 8A);**
   e) Submit the signed **Illicit Discharge Compliance Statement** according to the Stormwater Handbook Standard 10 found in Vol 1, Chapter 1, page 25;
   (Received September 3rd 2024)
   f) Submit a a copy of the O & M plan, understand the maintenance requirements and have funds available to perform maintenance activities required in the plan;
   g) Submit two (2) **As-Built Plans in hard copy and a pdf**, signed and stamped by a registered professional engineer or registered land surveyor, that includes but is not limited to, all final work completed in compliance with the proposed and approved work listed in the Notice of Intent, all regrading, visual barriers, and Resource Areas; and
   h) Submit a letter from the registered professional engineer or registered land surveyor describing compliance with the Order of Conditions and explain any deviations from the approved plan.

20) Any areas where the limit of work is less than 50 feet to the bordering vegetated wetland, the applicant shall install a **double row of sediment controls** separated by a minimum of 10 feet as required in the EPA's Construction General Permit (CGP). It is assumed that Standard 8 of MA DEP Stormwater Management requirements will not be met until the project is in compliance with this condition.

21) All disturbed areas shall be immediately stabilized if they are to remain unused for 14 days or longer. Temporary slope stabilization methods shall include erosion control blankets for

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slopes 2:1 or steeper; stabilization of areas flatter than 2:1 may include temporary loam and seed and/or straw mulch. Stabilization of exposed areas shall be provided throughout construction such that slopes are protected from slumping, and erosion of exposed surfaces is minimized to prevent sediment transport.

22) If temporary or final stabilization of disturbed areas is not achieved on disturbed areas by **October 15**, temporary stabilization consisting of clean grain straw mulch at a rate of 2 tons per acre shall be applied to exposed areas (Or 3-inch thickness, with no bare spots or ground showing). Mulch anchoring shall consist of tackifier or jute netting.

23) There shall be no sedimentation into wetland or water bodies from discharge pipes or surface runoff leaving the site. Accumulated sediment in the **road shall be swept** at the end of each work day.

24) During activities subject to Conservation Commission jurisdiction, additional erosion and sediment controls deemed necessary by the Commission/Agent shall be installed by the applicant upon such request.

25) All debris or "dumped" material placed in wetland resource areas and the buffer zone shall be removed by the applicant/owner. All dumped materials, trash and debris shall be removed.

General Construction:

26) Concrete washout areas shall be constructed and located more than 100 feet from a bordering vegetated wetland or other resource area as shown on the final approved plan. Any concrete washout spilled directly onto soil observed on the site shall be immediately removed.

27) The Contractor is prohibited from discharging groundwater, dewatering discharge or accumulated stormwater unless such waters are first treated by an appropriate sediment control. Appropriate controls include, but are not limited to, sediment basins or traps, dewatering tanks, weir tanks, or filtration systems (e.g., bag or sand filters) that are designed to remove sediment. Uncontaminated, non-turbid dewatering water, can be discharged without being routed to a control. Dewatering locations shall be approved by a qualified wetland professional not solely by the contractor.

28) All wetland resource areas shall be kept clean of rubbish, debris, and construction materials. The applicant/owner shall be responsible for ensuring all workers at the site properly dispose of materials.

29) Overburden materials shall be removed from the site and not spread within the 100-foot buffer zone.

Stormwater Management

30) The storm water management system is designed according to **DEP's Storm Water Management Standards and the Handbook (February 2008).** Any portions not functioning as designed shall be corrected by the applicant/owner at the applicant/owner's expense prior

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to issuance of a Certificate of Compliance. All components shall be cleaned prior to issuance of a Certificate of Compliance.

31) All storm water management systems shall be properly installed and maintained by the owner according to the **Operation and Maintenance Plan**. At a minimum, the owner shall perform an annual inspection and maintenance program and a biannual sweeping program for the roadways, at a minimum in March and September of each year.

32) **Snow** shall not be stockpiled or pushed into any storm water management BMP or wetland resource area.

33) Location of the infiltration basin shall be staked in the field with orange construction fencing after the initial vegetation clearing to prevent compaction of soils by construction vehicles.

34) SWPPP inspection reports shall be submitted to the Commission/Agent, at the frequency outlined in the Stormwater Prevention Pollution Plan.

Floodplain compensation

35) Floodplain compensation shall meet performance standards for BLSF in accordance with 310 CMR 10.57 as outlined in the Notice of Intent.

36) The floodplain compensation area shall be graded, loamed, seeded and stabilized.

Vegetation Management

37) Vegetation management in impacted Buffer Zones and Riverfront Area shall follow the notes on the final approved plans and be conducted and/or directed by a wetland professional. Areas temporarily impacted shall be restored to pre-construction conditions, including regrading, and loaming and seeding with a midheight grassland upland seed mix. The seed mix shall be 100% native to Massachusetts and benefit pollinator habitat. Vegetation shall have a 75% survival rate after a period of two years.

Under Mendon Wetland Protection Bylaw (Ch. 28) and local Regulations
Massachusetts Department of Transportation, as a state agency is exempt from local Bylaws and regulations.

Under Mass Endangered Species Act and Natural Heritage Endanged Species Program
NHESP File No.: 24-18775
Heritage Hub Form ID: RC-86905
Findings:

Provided the attached conditions are fully implemented and there are no changes to the project plans, this project will not result in a Take of state-listed species. We note that all work is subject to the anti-segmentation provisions (321 CMR 10.16) of the MESA. This determination is a final decision of the Division of Fisheries and Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to the MESA. This project may be subject to further

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review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Special Conditions:

To avoid adverse effects to the Resource Area Habitats and to avoid a prohibited Take of state-listed species, the following condition(s) must be met:

1. Fisheries Protection: To minimize potential impacts to state listed fish, no work associated with the Muddy Brook culvert replacement portion of the project shall occur from April 1- May 31. If construction work is not finished by April 1 of a given year, the applicant shall provide the Division with a detailed hydraulic control plan to allow for fish passage to occur through the work area during April 1- May 31. The Division is available for consultation on this plan.

END OF CONDITIONS

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DOCUMENT A00870

MASSACHUSETTS HISTORICAL PRESERVATION ACT SECTION 106 NO ADVERSE AFFECT LETTER

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

MassDOT Massachusetts Department of Transportation Highway Division

RC. 69951

December 10, 2024

CONCURRENCE Brona Simon
1/7/25
BRONA SIMON
STATE HISTORIC
PRESERVATION OFFICER
MASSACHUSETTS
HISTORICAL COMMISSION

RECEIVED
DEC 10 2024
MASS. HIST. COMM

Ms. Brona Simon, Executive Director
Massachusetts Historical Commission
State Historic Preservation Officer
220 Morrissey Boulevard
Boston, MA 02125

RE: Mendon, Route 16 Resurfacing and Related Work (608491)
Section 106 Review - No Adverse Effect
Section 4(f) Evaluation – Fee Takings and Permanent Easements – *de minimis*
Section 4(f) Evaluation – Temporary Occupancies – No 4(f) Use

Dear Ms. Simon:

The Massachusetts Department of Transportation (MassDOT) is proposing to expend federal funds to resurface and construct related work along Route 16 in Mendon. The project corridor will extend for 1.9 miles from Taft Avenue northerly to the Hopedale Town Line. Route 16 is known locally by three different names along the project corridor: Uxbridge Road from Taft Avenue north to Millville Road, Hastings Street from Milleville Road north to North Ave./Main St., and Milford Street from North Ave./Main St. north to the Hopedale Town Line. Route 16 is a state highway owned and maintained by MassDOT.

Route 16 extends through the Mendon Center Historic District, which is listed in the National Register of Historic Places. The historic district includes the entire length of Hastings Street and a 0.6-mile segment of Milford Street. Main Street and Maple Street, which intersect with Route 16, also are within the historic district. The historic district is primarily residential along the project corridor with dates of construction extending from the 1830s into the early 20th century. Founders Park, a 0.75-acre pocket park established by the Town in 1906 on a former residential parcel, is located along Hastings Street at the southwesterly corner of Main Street. Hastings Street between Emerson Street and Main Street is also within the Mendon Center Local Historic District.

MassDOT has reviewed the project under the Massachusetts Statewide Programmatic Agreement for Section 106 of the National Historic Preservation Act of 1966, as amended [36 CFR 800], and has determined that the proposed work will have **No Adverse Effect** on any properties that are listed or eligible for listing in the National Register of Historic Places.

MassDOT's design consultant, HNTB, made a virtual presentation to members of both the Mendon Historical Commission and the Mendon Historic District Commission on June 28, 2020. None of the commission members in attendance expressed objections or substantial concerns about the proposed project. MassDOT is forwarding copies of this No Adverse Effect finding to both commissions to update them on the project design.

Proposed Work along the Project Corridor

- Route 16 will be milled and resurfaced for the entire length of the project corridor. The roadway will be widened along the southbound travel lane primarily within the existing State Highway Layout (SHLO) to provide additional cross section to accommodate turn lanes and a continuous 5'-wide shoulder for a southbound bicycle lane. A 5.5'-wide continuous asphalt sidewalk will be constructed within the SHLO along the southbound travel lane for the entire length of the project corridor. The sidewalk will include granite curbs and ADA compliant ramps.
- The curbline along the northbound travel lane will be extended into the existing roadway to allow for the construction of an 8'-wide asphalt shared use path along the roadway within the existing SHLO.
- Two stormwater management areas will be constructed within the project corridor. Both will consist of grassed channels with sediment forebays and stone checkdams for collection and treatment of stormwater runoff. One of the stormwater management areas is located along southbound Route 16 (Uxbridge Road) south of the Hartford Avenue intersection near the southerly limit of the project corridor. The other is located along northbound Route 16 (Milford Street) at Muddy Brook near the northerly limit of the project corridor. These stormwater management areas are discussed further in the archaeological section below.
- An existing reinforced concrete culvert that conveys Muddy Brook under Route 16 will be retained in place but will be extended under the new shared use path along the northbound side of the roadway. A new concrete headwall will be constructed at the culvert extension and riprap will be installed along the slope.

Mendon Center Historic District

Vibration Monitoring. Seismographs will be placed in five dwellings along northbound Hastings Street within the Mendon Center Historic District to monitor construction vibrations during pavement milling, resurfacing, and shared use path construction along. The seismographs will be placed only with the permission of the respective property owners. Pre-construction photos of the interiors of those dwellings also will be taken to provide a baseline to determine if any vibration impacts might be the result of construction activities. These dwellings include #4 Hastings Street, #6 Hastings Street, #8 Hastings Street, and #10 Hastings Street, which front onto Hastings Street and are very close to the current edge of pavement. The fifth dwelling is #23 Maple Street, the rear elevation of which is also very close to the edge of pavement along Hastings Street. The seismographs will be monitored during construction by a professional engineer certified in such work. A special provision (attached) will be included in the construction contract regarding vibration monitoring.

Maple Street. (Sheets 38, 133, and 154 of the Construction Plans) The Y-intersection of Maple Street at Hastings Street will be reconfigured to create a more perpendicular Maple Street approach at the intersection. Maple Street is currently under STOP sign control at the intersection while traffic on Hastings Street is free-flowing. A slip lane along northbound Hastings Street allows traffic to veer onto Maple Street at high speeds. The Y-intersection is adjacent to the **Woods Civil War Memorial (MEN.901)** on a narrow gore parcel on the north

side of the intersection. The memorial is partially within the SHLO. A paved cut-through lane behind the Civil War Memorial currently provides a perpendicular approach (without STOP sign control) for traffic on Maple Street to turn right onto northbound Hastings Street.

The Maple Street approach at the intersection will be shifted north through the gore parcel to create a more perpendicular alignment at Hastings Street. The Civil War Memorial, including the granite border around the memorial, will be moved about 10' to the north on the same parcel but outside of the SHLO. The existing cut-through lane behind the memorial will be resurfaced as a parking area off Maple Street but access onto Hastings Street will be eliminated. A sidewalk will be constructed along Maple Street at the intersection adjacent to the memorial. The intersection will be signalized, and new mast arm traffic signals will be installed. The new mast arm signal poles will be powder coated black to make them less conspicuous in the historic district. Left turns from southbound Hastings Street onto Maple Street will be prohibited. A special provision for Monument Removed and Reset #2 (Item 714.02, enclosed) will be included in the construction contract.

A new mid-block pedestrian crosswalk will be created across Hastings Street approximately 540' north of the Maple Street intersection. Rectangular rapid flashing beacons will be installed at either end of the new crosswalk to provide additional safety for pedestrians. The poles that support the RRFBs will be powder coated black to make them less conspicuous in the historic district. Please see Sheet 134 of the construction plans.

Main Street/North Street. (Sheets 40, 135, and 154) The approaches at the four-legged signalized intersection of Main Street, North Street, Hastings Street (Route 16), and Milford Street (Route 16) will be widened to provide dedicated turn lanes, a continuous dedicated bicycle lane along southbound Route 16, a dedicated bicycle lane along westbound Main Street, and a dedicated bicycle lane along eastbound North Street.

The existing outmoded vertical signal poles will be replaced at the intersection with new mast arm signal poles, which will be powder coated black to make them less conspicuous in the historic district.

The existing stone balance walls along southbound Milford Street will be removed and reset behind the new edge of pavement to provide the necessary additional cross section at the Milford Street approach to the intersection. Any stone balance walls along Milford Street that will not be affected by the roadway widening will be retained in place. The new alignments for the reset stone balance walls are highlighted in yellow on the construction plans. A special provision for Historic Stone Balance Walls Removed and Reset (Item 691.2, enclosed) will be included in the construction contract.

A stone retaining wall, formerly on the property of the W. H. Comstock House (MEN.54), 1 Hastings Street at North Street, will be removed and reset behind the new sidewalk along southbound Hastings Street and eastbound North Street to provide the necessary additional cross section at those approaches to the intersection. The W. H. Comstock House was demolished by others and the parcel is currently occupied by a modern bank building. The retaining wall, highlighted in yellow on the construction plans, will be reconstructed along Hastings Street and

at the corner of North Street using the existing stones and matching new stones as necessary. The segment of wall along North Street that will not be affected by the intersection reconfiguration will be retained in place. A special provision for Historic Stone Masonry Walls Removed and Reset (Item 691.01, enclosed) will be included in the construction contract. Please see Sheets 40, 136, 154, and 200-202 of the construction plans.

All stone wall reconstruction will be designed and supervised by a professional stone mason.

A triangular traffic island at the Main Street approach to the intersection will be removed to provide the necessary additional cross section at the Main Street approach to the intersection. A cast iron directional sign will be removed from the traffic island and reset at the reconfigured corner of Main Street and Milford Street.

No roadway widening is proposed along northbound Hastings Street or westbound Main Street adjacent to Founders Park. The existing granite Milestone 37, dated 1785, on Hastings Street along the former Middle Post Road adjacent to Founders Park will remain in place behind the proposed new shared use path (SUP) and will be protected with temporary chain link fencing during construction. Milestone 37 is within the existing SHLO. An adjacent granite post, which appears to be a property line marker, also will be retained and will be protected behind the temporary fencing during construction. The SUP will be constructed with a 2'-wide buffer separating it from the milestone, which is considered adequate width to protect the milestone from snowplow strikes. The current plans enclosed with this submittal indicate that Milestone 37 will be removed and reset but those plans will be revised to indicate that the milestone will be retained in place and protected. MassDOT has prepared an Inventory Form C for Milestone 37, which is eclosed with this submittal.

Other Stonework. (Sheet 38) A pair of parallel stone masonry walls along a walkway in front of the c. 1908 Craftsman style dwelling at **#21 Hastings Street (MEN.63)** are partially within the existing SHLO. The two walls will be dissembled by a professional stone mason and reset on either side of the reconstructed walkway behind the proposed new sidewalk along southbound Hastings Street at that location. A special provision for Historic Stone Railing Walls Removed and Reset (Item 691.01, enclosed) will be included in the construction contract.

A set of three granite steps in front of the **South Parish Unitarian Church Parsonage (MEN.62)**, 17 Hastings Street, also will be removed and reset behind the proposed new sidewalk along southbound Hastings Street at that location. The granite steps are partially within the SHLO. A special provision for Granite Steps Removed and Relaid (Item 706.4, enclosed) will be included in the construction contract.

Archaeological Assessment

A review of the MHC's archaeological maps in MACRIS revealed four recorded pre-contact sites in the vicinity of the project area.

- Site 19-WR-107 is an unnamed site recorded 0.25-miles southwesterly of the Uxbridge Rd. / Taft Ave. intersection.

- Site 19-WR-673 (Nextel Tower Site) is an isolated flake scatter identified in 2000 as part of a cell tower survey. This site is recorded approximately 0.15-miles southwesterly of the Uxbridge Rd. / Taft Ave. intersection. No diagnostic artifacts were recovered, and the site was determined to be not significant.
- Site 19-WR-1130 (321w-3 Site) is an isolated flake scatter identified in 2017 as part of a National Grid feeder pole location survey. The site is recorded approximately 0.25-miles northwesterly of the Uxbridge Rd. / Hartford Ave. intersection.
- Site 19-WR-798 (Upton State Forest Site) is a find spot identified in advance of gas line surveys conducted 1989 and 1991. The site is recorded near Dudley Road approximately 0.25-miles northerly of the current project area.

An additional archaeological survey was conducted in 1987 immediately west of the current project area in advance of Hartford Avenue reconstruction work. The survey identified four historic sites and no pre-contact sites. The historic sites are recorded in the Town of Uxbridge well outside of the current project's APE.

Although undisturbed areas near Nipmuc Pond and Muddy Brook may be sensitive for archaeological resources, it is the opinion of the MassDOT Archaeologist, Jameson Harwood, that the Uxbridge Rd (Route 16) project's direct APE has low sensitivity for significant archaeological resources based on the results of previous archaeological surveys, the impacts of previous roadway, trolley line, sidewalk, utility, and drainage construction, roadside development, and unfavorable conditions (wetland / slope). The project work will be confined to disturbed / unfavorable areas within and immediately adjacent to the existing state highway layout.

Infiltration Basin at Uxbridge Rd / Hartford Ave Intersection (Station 205 to Station 210 LT on Sheets 31-32, 102-103, and 188 of the enclosed Construction Plans)

Drainage work between Station 205+00 LT and Station 210+00 LT will consist of the construction of an infiltration basin along the north side of Uxbridge Road and drainage ditch to the adjacent wetlands. A review of historic maps and aerials indicates this location has been modified throughout the early 20th century. A review of the 1908 USGS map shows a short section of rail line near the western end of the project area that curves from Nipmuc Pond northeasterly to Uxbridge Road. The Town of Mendon's Open Space and Recreation Plan notes that the Milford and Uxbridge Trolley Line opened on December 20, 1901 to provide public access to a park at Nipmuc Pond. This section of rail line does not appear on 1919 USGS map.

The 1938 historic aerial and the 1944 USGS map shows the new alignment of Route 16/Uxbridge Road to the east of the Uxbridge Road / Hartford Avenue "T" intersection. This "T" intersection was bypassed and the former Uxbridge Road approach to Hartford Avenue was removed as it does not appear on the 1953 USGS map.

The 2013 Streetview image shows an overgrown paved driveway at the proposed location of the infiltration basin. The 1967 and 1971 aerials show cleared areas and a section of driveway/roadway along the north side of Uxbridge Road at this location. A further review of aerials indicates the cleared areas and roadway have become overgrown with vegetation throughout the late 20th and early 21st century.

Infiltration Basin (Station 268 RT to Station 270+50 RT on Sheets 42-43, 113-114, and 189 of the Construction Plans)

The proposed infiltration basin to be constructed along the south side of the roadway at 21 Milford St. (Route 16) between Station 268 RT to Sta 270 + 50 RT will upgrade an existing drainage swale.

Infiltration Basin (Station 274+50 RT)

The proposed drainage work near Station 274+50 will upgrade existing culverts and drainage structures near Muddy Brook. The infiltration basin will be along the toe of the roadway slope.

Section 4(f) Evaluation – Fee Takings and Permanent Easements – *de minimis* impact

This project requires minor fee takings and permanent easements on parcels occupied by properties that contribute to the National Register-listed **Mendon Center Historic District.** Any fee takings or easements that result in the permanent incorporation of land from a public or private historic site into a transportation facility is regarded as a transportation use and must be evaluated and approved under Section 4(f) of the National Transportation Act of 1966, as amended [23 CFR Part 774].

Fee takings are highlighted in blue on the enclosed ROW plans. The following fee takings are required along the southbound side of Hastings Street to create a consistent cross section of sidewalk construction.

- **Cook-Darling House (MEN.68),** 33 Hastings Street, Parcel 2-17 (62 sf).
- **G. A. Staples House (MEN.67),** 31 Hastings Street, Parcel 2-18 (4 sf).
- **Cook-Adams House (MEN.64),** 23 Hastings Street, Parcel 2-6 (46 sf).
- **Ebenezer Haywood-Davenport House (MEN.58),** 7 Hastings Street, Parcel 2-15 (1 sf).
- **Dr. John G. Metcalf House (MEN.55),** 3 Hastings Street, Parcel 2-5 (339 sf).

A fee taking also is required for traffic signal installation on the southbound side of Hastings Street across from the Maple Street intersection.

- **House at 21 Hastings Street (MEN.63),** Parcel 2-13 (20 sf).

Permanent utility easements (PUEs), highlighted in pink on the ROW plans, are required on parcels occupied by contributing properties within the National Register-listed Mendon Center Historic District. The PUEs are required for realignment of overhead utility wires or installation of utility poles with guy wires.

- **Cook-Darling House (MEN.68),** 33 Hastings Street, Parcel 2-PUE-2 (600 sf).
- **G. A. Staples House (MEN.67),** 31 Hastings Street, Parcel 2-PUE-3 (733 sf).
- **Cook-Adams House (MEN.64),** 23 Hastings Street, Parcel 2-PUE-24 (92 sf).
- **House at 21 Hastings Street (MEN.36),** Parcels 2-PUE-7 (28 sf) and 2-PUE-39 (70 sf).
- **Seth Hastings House (MEN.60),** 10 Hastings Street, Parcel 2-PUE-12 (968 sf).
- **Holland-Albee Bakery Worker House (MEN.59),** 8 Hastings St., Parcel 2-PUE-56 (38 sf).
- **Town of Mendon, Woods Civil War Memorial (MEN. 901),** Hastings Street at Maple Street, Parcel 2-PUE-5 (467 sf).\
- **Hayward-Taft House (MEN.106),** 38 Maple Street, Parcels 2-PUE-6 (592 sf) and 2-PUE-53 (40 sf).
- **D. Eames-Wallahan House (MEN.100),** 23 Maple Street, Parcel 2-PUE-34 (273 sf).
- **B. Anthony-Inman House (MEN.98),** 17 Maple Street, Parcel 2-PUE-10 (137 sf).
- **House at 34 Maple Street (MEN.105),** Parcel 2-PUE-38-T (48 sf).
- **House at 11 Milford Street (MEN.234),** Parcel 2-PUE-42 (67 sf).

Permanent drainage easements, highlighted in pink on the ROW plans, are required on parcels occupied by contributing properties within the National Register-listed Mendon Center Historic District. The drainage easements are required for construction of linear roadside drainage ditches.

- **Cook-Adams House (MEN.64),** 23 Hastings Street, Parcels 2-D-8 (660 sf) and 2-D-9 (213 sf).
- **House at 21 Hastings Street (MEN.36),** Parcels 2-D-10 (174 sf), 2-D-11 (368 sf), and 2-D-12 (131 sf).
- **South Parish Unitarian Church Parsonage (MEN.62),** 17 Hastings Street, Parcel 2-D-13 (506 sf).
- **Walter T. Metcalf House (MEN.61),** 15 Hastings Street, Parcel 2-D-14 (277 sf).
- **Ebenezer Haywood-Davenport House (MEN.58),** 7 Hastings St., Parcel 2-D-15 (249 sf).
- **Dr. John G. Metcalf House (MEN.55),** 3 Hastings Street, Parcel 2-D-17 (665 sf).

Permanent highway sign easements, highlighted in pink on the ROW plans, are required on parcels occupied by contributing properties within the National Register-listed Mendon Center Historic District. These easements are required for the installation of roadside highway signs.

- **B. Anthony-Inman House (MEN.98),** 17 Maple Street, Parcel 2-HS-2-T (8 sf).
- **Dr. John G. Metcalf House (MEN.55),** 3 Hastings Street, Parcel 2-HS-6 (6 sf).

It is MassDOT's expectation that the Federal Highway Administration (FHWA) will determine that the proposed permanent easements meet the criteria for a Section 4(f) *de minimis* finding, pursuant to 23 CFR 774.3(b). This project, therefore, does not require an individual Section 4(f) evaluation. This letter is intended to inform the State Historic Preservation Officer (SHPO) that this project is expected to qualify for a *de minimis* finding under Section 4(f) based on the concurrence of your office with this Section 106 finding of No Adverse Effect, pursuant to 23 CFR 774.5(b)(1)(ii).

Section 106 Effect Finding

It is MassDOT's opinion that the proposed resurfacing and widening of Route 16 in Mendon will have **No Adverse Effect** on the National Register-listed Mendon Center Historic District. MassDOT has designed the project to remain within the existing State Highway Layout to the greatest extent feasible, with minimal fee takings from parcels occupied by properties that contribute to the historic district. The existing paved roadway will be narrowed along Hastings Street to provide the necessary cross section to construct an 8'-wide shared use path along the northbound side of Route 16 without requiring any additional right of way in the historic district. All new traffic signal poles within the historic district will be powder coated black to make them less conspicuous. Seismographs will be installed in five dwellings along northbound Hastings Street within the historic district to monitor vibrations during construction that could be potentially harmful to the historic properties.

MassDOT will carefully remove the Woods Civil War Memorial from within the SHLO at the intersection of Hastings Street and Maple Street and relocate the memorial to an appropriate nearby location on the same parcel but entirely outside of the SHLO. Other stone features along Route 16 within the historic district, such as balance walls, retaining walls, railing walls, and stone slab steps, also will be carefully removed and reset outside of the SHLO or beyond the edge of pavement under the supervision of a professional stone mason. The 1785 Milestone 37 will remain in its current location within the SHLO adjacent to Founders Park and will be protected during construction. MassDOT has prepared an inventory form for Milestone 37, which is enclosed with this submittal.

MassDOT solicits your concurrence with this No Adverse Effect finding in accordance with Stipulation V.C.1 of the amended Section 106 Programmatic Agreement. A copy of this letter will be forwarded to the Federal Highway Administration as specified under the terms of the Programmatic Agreement. If you should have any questions, please feel free to contact me at 978-325-2094.

Sincerely,

Jeffrey Shrimpton

Jeffrey Shrimpton
Program Engineer for Design
Environmental Services

c.c.: Mendon Historical Commission
Mendon Historic District Commission
Kenneth S. Miller, FHWA

encs: Locus Map
Construction & Right of Way Plans
Special provisions
Milestone 37 inventory form

DOCUMENT A00872

MASSACHUSETTS ENDANGERED SPECIES ACT NO TAKE LETTER

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MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

August 22, 2024

Marissa Seifert
31 St James Ave
Boston, MA 02116

Mendon Conservation Commission
P.O. Box 2
Mendon, MA 01756

RE: Applicant: Marissa Seifert
Project Location: Route 16, just west of Taft Avenue east to Mendon town line
Project Description: Resurfacing and Related Work on Route 16
DEP Wetlands File No.: 218-0853
NHESP File No.: 24-18775

Dear Commissioners and Applicant:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division") received a Notice of Intent in compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.58(4)(b)). The Division also received the MESA Review Checklist and supporting documentation for review pursuant to the MA Endangered Species Act Regulations (321 CMR 10.18).

The Division has determined that this Project, as currently proposed, will occur **within** the actual habitat of the following species:

Scientific Name	Common Name	Taxonomic Group	State Status
Glyptemys insculpta	Wood Turtle	Reptile	Special Concern
Lethenteron appendix	American Brook Lamprey	Fish	Threatened

These species and their habitats are protected in accordance with the rare species provisions of the WPA and the MESA.

Wetlands Protection Act (WPA)
Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **will not adversely affect** the actual

Resource Area Habitat of state-protected rare wildlife species. Therefore, it is our opinion that this project meets the state-listed species performance standard for the issuance of an Order of Conditions.

Please note that this determination addresses only the matter of rare wildlife habitat and does not pertain to other wildlife habitat issues that may be pertinent to the proposed project.

Massachusetts Endangered Species Act (MESA)

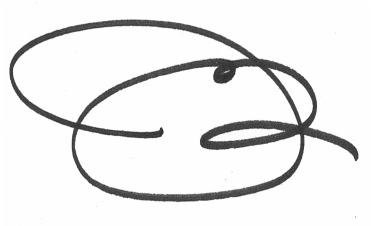
The MESA is administered by the Division, and prohibits the Take of state-listed species. The Take of state-listed species is defined as "in reference to animals…harm…kill…disrupt the nesting, breeding, feeding or migratory activity…and in reference to plants…collect, pick, kill, transplant, cut or process…Disruption of nesting, breeding, feeding, or migratory activity may result from, but is not limited to, the modification, degradation, or destruction of Habitat" of state-listed species (321 CMR 10.02).

Based on the information provided and the information contained in our database, the Division finds that this project, as currently proposed, **must be conditioned** to avoid a prohibited Take of state-listed species (321 CMR 10.18(2)(a)). **To avoid a prohibited Take of state-listed species, the conditions attached to this letter must be met.**

Provided the attached conditions are fully implemented and there are no changes to the project plans, this project will not result in a Take of state-listed species. We note that all work is subject to the anti-segmentation provisions (321 CMR 10.16) of the MESA. This determination is a final decision of the Division of Fisheries and Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to the MESA. This project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions regarding this letter please contact Melany Cheeseman, Endangered Species Review Assistant, at Melany.Cheeseman@mass.gov, (508) 389-6357.

Sincerely,



Jesse Leddick
Assistant Director

cc: Massachusetts Department of Transportation
Mendon Conservation Commission
DEP Central Region

Attachment: List of Conditions

List of Conditions

Applicant: Marissa Seifert
Project Location: Route 16, just west of Taft Avenue east to Mendon town line
Project Description: Resurfacing and Related Work on Route 16
NHESP File No.: 24-18775
Heritage Hub Form ID: RC-86905
Approved Plan: Massachusetts Department of Transportation Highway Division Plan and Profile of Uxbridge Road, Hastings Street, Milford Street (Route 16) in the Town of Mendon Worcester County
Plan date: 2/23/24 Revised Date: N/A

To avoid a prohibited Take of state-listed species, the following condition(s) must be met:

1. **Fisheries Protection:** To minimize potential impacts to state listed fish, no work associated with the Muddy Brook culvert replacement portion of the project shall occur from April 1- May 31. If construction work is not finished by April 1 of a given year, the applicant shall provide the Division with a detailed hydraulic control plan plan to allow for fish passage to occur through the work area during April 1- May 31. The Division is available for consultation on this plan.

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DOCUMENT A00875

POLICY DIRECTIVE P-22-001
AND
POLICY DIRECTIVE P-22-002

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massDOT Massachusetts Department of Transportation Highway Division

Number: P-22-001
Date: 9/23/22

POLICY DIRECTIVE

Jonathan Gulliver (signature on original)
HIGHWAY ADMINISTRATOR

Off-Site Stockpiling of Soil from MassDOT Construction Projects

Purpose

The purpose of this Policy Directive is to formally establish a policy and procedures for managing and stockpiling soil generated and transported from MassDOT construction projects. This Policy Directive does not supersede any Federal, State, or Local regulations.

Date of Effect

This Policy Directive is effective immediately for all projects, including active construction projects.

For active construction projects and for other projects advertised prior to October 15, 2022, changes to the contract documents needed to implement the requirements of this Policy Directive will be considered on a case-by-case basis and shall be approved by the District Highway Director, as necessary.

For projects advertised on or after October 15, 2022, MassDOT will include the requirements and implementation procedures of this Policy Directive in the construction contract documents.

Policy Requirements

This policy is intended to prevent the off-site relocation of excavated soil generated from MassDOT projects to areas near residential receptors and to control potential fugitive dusts and/or contaminants. To that end, excavated soil may not be moved from the project site without knowledge of the content of the material. Knowledge may include visual field observations for presence of staining, odor, and/or debris, screening with a photoionization detector (PID), laboratory analysis, and/or site history. Pavement millings and other non-soil materials are not subject to the requirements of this Policy Directive.

Moving soil from a MassDOT project site to a temporary off-site storage location must be approved in writing by the District Highway Director.

The Contractor must select a storage location that is at least 500 feet away from residential receptors, as defined herein to include, but not be limited to, residential dwellings, residentially

zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities.

Temporary off-site storage of excavated soil from a MassDOT project is only permissible at a location approved and permitted by MassDOT. The temporary storage location should be located within the same municipality where the soil was excavated, where possible. Stockpiled soil must be securely covered, and appropriate measures must be taken to minimize fugitive dust and erosion.

Signs indicating the source of the soil, the date the soil was generated, and contact information must be erected and maintained until the stockpiled soils are transported to a disposal facility or reused on the project site.

Implementation Procedures

To ensure that off-site storage of excavated soils is managed properly on MassDOT projects, this policy requires the following:

1. **Off-Site Stockpile Storage Locations**
    a. The Contractor shall provide proposed off-site storage locations to the Engineer for approval at least 30 days prior to transporting soil off site. Off-site storage locations should be in the same municipality as the work site.
    b. The Contractor shall keep excavated soil on site until adequately characterized to the satisfaction of the Engineer.
    c. The Contractor shall provide notification of the approved off-site storage location to the local Board of Health and the Town Manager's/Mayor's Office at least 7-days prior to transporting soil off site.
    d. The Contractor shall provide the Engineer with at least 3-days' notice prior to transporting soil off site.
    e. For off-site storage locations on MassDOT property, the Contractor is required to obtain an Access Permit through the District Permits Office prior to storage of soil or other materials. MassDOT will issue these permits at no cost to the Contractor. Information to be submitted by the Contractor as part of the permit application shall include:
        i. A description of material to be stored off-site, including available analytical data;
        ii. A figure of the location with distances to residences and residential receptors; and
        iii. Anticipated duration of temporary storage.
    f. Stockpile locations should not be within 500 feet of residential receptors (e.g., residential dwellings, residentially zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities).
        i. If the stockpile location must be within 500 feet of residential receptors, then soil must be less than RCS-1 (per 310 CMR 40.1600) and free of potentially hazardous or regulated items.

g. For off-site storage locations on non-MassDOT property, the Contractor must notify the property owner(s) at least 7 days prior to transporting material.
h. Exceptions to these rules will be reviewed by MassDOT and may be approved by the District Highway Director on a case-by-case basis.

2. Off-Site Stockpile Management

a. The Contractor shall keep soil stockpiles on impermeable surfaces (e.g., asphalt or concrete) or on 10-mil polyethylene sheeting.
b. The Contractor shall cover soil stockpiles with 10-mil polyethylene sheeting and surround with a berm made of hay bales, straw wattles, or similar.
    i. Piles that are actively being worked on must be covered and re-secured at the end of the work shift.
c. The Contractor shall label stockpiles with signs, including:
    i. Location of origin (including any Release Tracking Numbers)
    ii. Stockpile ID number (including MassDOT District office-assigned tracking ID, if different)
    iii. Date of initial accumulation
    iv. Applicable telephone numbers for the Contractor and MassDOT.
d. The Contractor shall mitigate fugitive dust at storage locations under the direction of an appropriately trained/certified environmental professional.
e. The Contractor shall remedy noncompliance with this policy within 48 hours.
f. The Contractor shall remedy noncompliance with this policy on the SAME DAY for potentially hazardous material, as determined by the Engineer.
g. The Contractor shall handle excavated soil according to federal, state, and local regulations.
h. The Contractor shall use appropriate shipping documents for all movements of excavated soil on public roadways (e.g., Bill of Lading, Material Shipping Record, Manifest, Asbestos Waste Shipment Record, etc.).

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massDOT Massachusetts Department of Transportation Highway Division

Number: P-22-002
Date: 9/23/22

POLICY DIRECTIVE

Jonathan Gulliver (signature on original)
HIGHWAY ADMINISTRATOR

Use of MassDOT Property for Staging and other Construction-Related Operations

Purpose

This Policy Directive is intended to address the use of MassDOT property by MassDOT Contractors for construction staging and other construction-related operations that are not specifically defined in the construction contract. Such use of MassDOT property will only be allowed if permitted by the District Office in accordance with 700 CMR 13.00, Approval of Access to MassDOT Highways and Other Property. This includes the use of MassDOT property for staging, laydown, and storage of equipment and materials, including soil excavated from a project site.

This Policy Directive requires the Contractor/applicant to obtain a Non-Vehicular Access Permit from MassDOT to use MassDOT property for these purposes.

This Policy Directive is effective immediately and applies to all MassDOT construction projects.

General Permit Considerations and Conditions

In addition to other normal MassDOT Access Permit procedures, MassDOT shall consider the following during the application, review, implementation and monitoring processes of Access Permits required by this Policy Directive:

- Storage and placement of the Contractor's equipment and materials should not be allowed within the clear zone of the roadway.
- Stockpiled soils should not be located within 500 feet of residential receptors, as defined herein to include, but not be limited to, residential dwellings, residentially zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities.
- The Contractor/applicant shall identify the access/egress locations of the proposed storage areas. MassDOT will only approve locations determined to be safe for roadway users, construction workers and the general public.
- The Contractor may be required to submit a Traffic Management Plan and/or Lighting Plan for MassDOT review and approval as part of the permit application, depending on the proposed use of the area.

- The Contractor shall submit the permit application through MassDOT's online State Highway Access Permit System (SHAPS).
- MassDOT will waive the permit application fee for any application received from a MassDOT Contractor for any permit required by this Policy Directive and will waive any subsequent amendment and extension fees that may otherwise be required.
- MassDOT will review the permit application in accordance with applicable standard procedures and will apply standard permit terms and conditions, as necessary.
- The Resident Engineer will verify that the permit is approved before allowing the Contractor to use the affected area for the requested purpose.
- Areas permitted are for use by the approved applicant only and are not to be shared with or used by other vendors. Subcontractors specifically engaged with the applicant working on the specific MassDOT project will be allowed to use the area in accordance with the terms of the permit.
- Permits are issued on an annual basis and will require the Contractor to file for an extension each year to continue use.

Exemptions from Permit Requirements

Equipment and materials being used for active construction operations and located within the work zone of the construction contract are exempt from this permit requirement, provided they do not interfere with the safety or operation of the roadway or the work zone. Examples of these types of exempt uses are:

- Equipment and materials parked or stored within a protected (barriered) work zone.
- Materials placed in the work zone prior to same-day installation or use.
- Soils excavated temporarily and scheduled to be replaced, such as for trenching operations or for installation of drainage structures.

DOCUMENT B00420

PROPOSAL

MENDON

For: **Resurfacing and Related Work on Route 16**

COMMONWEALTH OF MASSACHUSETTS

LOCATION

The work referred to herein is in the Town of MENDON in Worcester County, in the Commonwealth of Massachusetts, and is shown by the locus map (Document 00331) in the Proposal Pamphlet, the work locations extend as follows:

Route 16

Beginning – Station 201+00.00 +/-
Ending –Station 307+76.00 +/-

The contract prices shall include the furnishing of all materials (except as otherwise herein specified), the performing of all the labor requisite or proper, the providing of all necessary machinery, tools, apparatus and other means of construction, the doing of all the abovementioned work in the manner set forth, described and shown in the specifications and on the drawings for the work, and in the form of contract, and the completion thereof within **1325 CALENDAR DAYS** upon receipt of a Notice to Proceed, except that if the completion date falls between December 1 and March 15 then the same number of days beyond December 1st will be extended after March 15th.

The Work of this project is described by the following Items and quantities.

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Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
100.9	1	PRE-CONSTRUCTION SURVEY AND VIBRATION MONITORING OF HISTORIC HOUSES AT _____ LUMP SUM		
101.	1	CLEARING AND GRUBBING AT _____ PER ACRE		
102.	1	SELECTIVE CLEARING AND THINNING AT _____ PER ACRE		
102.1	1,000	TREE TRIMMING AT _____ PER FOOT		
102.3	20	HERBICIDE TREATMENT OF INVASIVE PLANTS AT _____ PER HOUR		
102.33	12	INVASIVE PLANT MANAGEMENT STRATEGY AT _____ PER HOUR		
102.511	30	TREE PROTECTION - ARMORING AND PRUNING AT _____ EACH		
102.513	435	AIR EXCAVATION AND ROOT PRUNING AT _____ PER FOOT		
102.521	3,050	TREE AND PLANT PROTECTION FENCE AT _____ PER FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
102.55	48	ARBORIST AT _____ PER HOUR		
103.	15	TREE REMOVED - DIAMETER UNDER 24 INCHES AT _____ EACH		
104.	4	TREE REMOVED - DIAMETER 24 INCHES AND OVER AT _____ EACH		
105.	7	STUMP REMOVED AT _____ EACH		
120.	17,120	EARTH EXCAVATION AT _____ PER CUBIC YARD		
121.	1,000	CLASS A ROCK EXCAVATION AT _____ PER CUBIC YARD		
127.1	35	REINFORCED CONCRETE EXCAVATION AT _____ PER CUBIC YARD		
141.	310	CLASS A TRENCH EXCAVATION AT _____ PER CUBIC YARD		
141.1	170	TEST PIT FOR EXPLORATION AT _____ PER CUBIC YARD		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
142.	1,435	CLASS B TRENCH EXCAVATION AT _____ PER CUBIC YARD		
145.	10	DRAINAGE STRUCTURE ABANDONED AT _____ EACH		
146.	50	DRAINAGE STRUCTURE REMOVED AT _____ EACH		
150.	100	ORDINARY BORROW AT _____ PER CUBIC YARD		
151.	10,100	GRAVEL BORROW AT _____ PER CUBIC YARD		
151.1	40	GRAVEL BORROW FOR BRIDGE FOUNDATION AT _____ PER CUBIC YARD		
151.2	265	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES AT _____ PER CUBIC YARD		
156.	195	CRUSHED STONE AT _____ PER TON		
156.1	70	CRUSHED STONE FOR BRIDGE FOUNDATIONS AT _____ PER TON		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
160.2	28	CONTROLLED LOW-STRENGTH MATERIAL - MECHANICAL EXCAVATABLE (101-300 PSI) AT _____ PER CUBIC YARD		
170.	23,450	FINE GRADING AND COMPACTING - SUBGRADE AREA AT _____ PER SQUARE YARD		
180.01	1	ENVIRONMENTAL HEALTH AND SAFETY PROGRAM AT _____ LUMP SUM		
180.02	16	PERSONAL PROTECTION LEVEL C UPGRADE AT _____ PER HOUR		
180.03	600	LICENSED SITE PROFESSIONAL SERVICES AT _____ PER HOUR		
181.11	419	DISPOSAL OF UNREGULATED SOIL AT _____ PER TON		
181.12	429	DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY AT _____ PER TON		
181.13	215	DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY AT _____ PER TON		
181.14	11	DISPOSAL OF HAZARDOUS WASTE AT _____ PER TON		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
182.1	1	INSPECTION AND TESTING FOR ASBESTOS AT _____ LUMP SUM		
182.2	72	REMOVAL OF ASBESTOS AT _____ PER FOOT		
183.1	10,000	TREATMENT OF CONTAMINATED GROUNDWATER AT _____ PER GALLON		
183.2	200	DISPOSAL OF GRANULAR ACTIVATED CARBON AT _____ PER POUND		
201.	115	CATCH BASIN AT _____ EACH		
201.4	13	SPECIAL CATCH BASIN - DOUBLE GRATE AT _____ EACH		
201.6	2	SPECIAL CATCH BASIN - OFFSET AT _____ EACH		
202.	65	MANHOLE AT _____ EACH		
202.2	2	MANHOLE (9 TO 14 FOOT DEPTH) AT _____ EACH		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
202.5	1	SPECIAL MANHOLE (WITH WEIR) AT _____ EACH		
203.5	12	SPECIAL MANHOLE (5 FOOT DIAMETER) AT _____ EACH		
203.6	9	SPECIAL MANHOLE (5 FOOT DIAMETER) AT _____ EACH		
204.11	5	GUTTER INLET - SPECIAL AT _____ EACH		
209.	5	DROP INLET, TYPE D AT _____ EACH		
220.	25	DRAINAGE STRUCTURE ADJUSTED AT _____ EACH		
220.3	11	DRAINAGE STRUCTURE CHANGE IN TYPE AT _____ EACH		
220.5	10	DRAINAGE STRUCTURE REMODELED AT _____ EACH		
220.7	1	SANITARY STRUCTURE ADJUSTED AT _____ EACH		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
221.1	95	FRAME AND COVER - SECURED AT _____ EACH		
222.1	95	FRAME AND GRATE - MASSDOT CASCADE TYPE AT _____ EACH		
222.2	5	FRAME AND GRATE - MASSDOT DROP INLET AT _____ EACH		
223.2	28	FRAME AND GRATE (OR COVER) REMOVED AND DISCARDED AT _____ EACH		
227.3	130	REMOVAL OF DRAINAGE STRUCTURE SEDIMENT AT _____ PER CUBIC YARD		
227.31	3,620	REMOVAL OF DRAINAGE PIPE SEDIMENT AT _____ PER FOOT		
227.4	46	MASONRY PLUG AT _____ PER SQUARE FOOT		
238.12	550	12 INCH DUCTILE IRON PIPE AT _____ PER FOOT		
238.18	60	18 INCH DUCTILE IRON PIPE AT _____ PER FOOT		

Project # 608491 Contract # 131468				
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
241.12	4,135	12 INCH REINFORCED CONCRETE PIPE CLASS III AT _____ PER FOOT		
241.15	2,740	15 INCH REINFORCED CONCRETE PIPE CLASS III AT _____ PER FOOT		
241.18	705	18 INCH REINFORCED CONCRETE PIPE CLASS III AT _____ PER FOOT		
241.30	15	30 INCH REINFORCED CONCRETE PIPE CLASS III AT _____ PER FOOT		
242.12	2	12 INCH REINFORCED CONCRETE PIPE FLARED END AT _____ EACH		
242.15	1	15 INCH REINFORCED CONCRETE PIPE FLARED END AT _____ EACH		
242.18	2	18 INCH REINFORCED CONCRETE PIPE FLARED END AT _____ EACH		
243.12	1,600	12 INCH REINFORCED CONCRETE PIPE CLASS IV AT _____ PER FOOT		
243.15	245	15 INCH REINFORCED CONCRETE PIPE CLASS IV AT _____ PER FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
243.18	130	18 INCH REINFORCED CONCRETE PIPE CLASS IV AT _____ PER FOOT		
244.12	240	12 INCH REINFORCED CONCRETE PIPE CLASS V AT _____ PER FOOT		
244.15	245	15 INCH REINFORCED CONCRETE PIPE CLASS V AT _____ PER FOOT		
244.18	85	18 INCH REINFORCED CONCRETE PIPE CLASS V AT _____ PER FOOT		
258.	10	STONE FOR PIPE ENDS AT _____ PER SQUARE YARD		
269.08	1,360	8 INCH SLOT-PERFORATED CORRUGATED PLASTIC PIPE (SUBDRAIN) AT _____ PER FOOT		
272.12	2,570	12 INCH AND UNDER PIPE REMOVED AND DISPOSED AT _____ PER FOOT		
272.15	1,020	15 INCH PIPE REMOVED AND DISPOSED AT _____ PER FOOT		
299.97	1	STORMWATER BMP 1 AT _____ LUMP SUM		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
299.971	1	STORMWATER BMP 2 AT _____ LUMP SUM		
302.10	50	10 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET) AT _____ PER FOOT		
309.	1,100	DUCTILE IRON FITTINGS FOR WATER PIPE AT _____ PER POUND		
316.10	42	WATER MAIN REMOVED AND DISPOSED AT _____ PER FOOT		
357.10	2	10 INCH GATE BOX AT _____ EACH		
358.	10	GATE BOX ADJUSTED AT _____ EACH		
371.10	6	10 INCH COUPLING AT _____ EACH		
376.4	1	HYDRANT - REMOVED AND DISCARDED AT _____ EACH		
376.5	4	HYDRANT - ADJUSTED AT _____ EACH		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
381.3	5	SERVICE BOX ADJUSTED AT _____ EACH		
402.	1,030	DENSE GRADED CRUSHED STONE FOR SUB-BASE AT _____ PER CUBIC YARD		
415.1	35,800	PAVEMENT STANDARD MILLING AT _____ PER SQUARE YARD		
431.	1,230	HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE AT _____ PER SQUARE YARD		
440.	92,900	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL AT _____ PER POUND		
443.	185	WATER FOR ROADWAY DUST CONTROL AT _____ PER 1000 GALLONS		
450.231	3,930	SUPERPAVE SURFACE COURSE - 12.5 POLYMER (SSC - 12.5 - P) AT _____ PER TON		
450.32	6,510	SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0) AT _____ PER TON		
450.42	1,500	SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) AT _____ PER TON		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
450.52	1,260	SUPERPAVE LEVELING COURSE - 9.5 (SLC - 9.5) AT _____ PER TON		
451.	1,500	HMA FOR PATCHING AT _____ PER TON		
452.	7,800	ASPHALT EMULSION FOR TACK COAT AT _____ PER GALLON		
453.	38,800	HMA JOINT ADHESIVE AT _____ PER FOOT		
470.	5	HOT MIX ASPHALT BERM AT _____ PER TON		
472.	690	TEMPORARY ASPHALT PATCHING AT _____ PER TON		
477.2	8,150	MILLED RUMBLE STRIP (TYPE C) AT _____ PER FOOT		
482.5	8,120	SAWCUTTING ASPHALT PAVEMENT FOR BOX WIDENING AT _____ PER FOOT		
506.	6,250	GRANITE CURB TYPE VB - STRAIGHT AT _____ PER FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
506.1	390	GRANITE CURB TYPE VB - CURVED AT _____ PER FOOT		
509.	970	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - STRAIGHT AT _____ PER FOOT		
509.1	640	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - CURVED AT _____ PER FOOT		
511.1	8,240	GRANITE EDGING TYPE SB - STRAIGHT AT _____ PER FOOT		
512.1	230	GRANITE EDGING TYPE SB (RADIUS 10 FEET OR LESS) AT _____ PER FOOT		
514.	113	GRANITE CURB INLET - STRAIGHT AT _____ EACH		
515.	2	GRANITE CURB INLET - CURVED AT _____ EACH		
516.	2	GRANITE CURB CORNER TYPE A AT _____ EACH		
570.2	270	HOT MIX ASPHALT CURB TYPE 2 AT _____ PER FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
580.	4,590	CURB REMOVED AND RESET AT _____ PER FOOT		
582.	23	CURB CORNER REMOVED AND RESET AT _____ EACH		
583.	210	EDGING REMOVED AND RESET AT _____ PER FOOT		
594.	4,810	CURB REMOVED AND DISCARDED AT _____ PER FOOT		
595.	45	CURB INLET REMOVED AND DISCARDED AT _____ EACH		
596.	14	CURB CORNER REMOVED AND DISCARDED AT _____ EACH		
597.	1,570	EDGING REMOVED AND DISCARDED AT _____ PER FOOT		
620.13	4,360	GUARDRAIL, TL-3 (SINGLE FACED) AT _____ PER FOOT		
620.133	400	GUARDRAIL, TL-3 (SINGLE FACED, NESTED) AT _____ PER FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
627.1	4	TRAILING ANCHORAGE AT _____ EACH		
627.83	25	GUARDRAIL TANGENT END TREATMENT, TL-3 AT _____ EACH		
628.21	1	TRANSITION TO NCHRP 350 GUARDRAIL AT _____ EACH		
628.305	6	TEMPORARY IMPACT ATTENUATOR, NON-REDIRECTIVE, TL-3 AT _____ EACH		
628.4	4	TEMPORARY IMPACT ATTENUATOR, REMOVED AND RESET AT _____ EACH		
630.2	3,725	HIGHWAY GUARD REMOVED AND DISCARDED AT _____ PER FOOT		
632.2	8	INDIVIDUAL POST REMOVED AND RESET AT _____ EACH		
632.3	2	INDIVIDUAL POST REMOVED AND STACKED AT _____ EACH		
655.	2,210	CEDAR RAIL FENCE AT _____ PER FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
665.	160	CHAIN LINK FENCE REMOVED AND STACKED AT _____ PER FOOT		
669.	40	FENCE REMOVED AND STACKED AT _____ PER FOOT		
669.1	130	FENCE REMOVED AND DISPOSED AT _____ PER FOOT		
671.	2	FENCE GATE AND GATE POSTS REMOVED AND STACKED AT _____ EACH		
685.	140	STONE MASONRY WALL IN CEMENT MORTAR AT _____ PER CUBIC YARD		
690.01	900	HISTORIC STONE MASONRY WALLS REMOVED AND REBUILT AT _____ PER FOOT		
690.11	460	STONE MASONRY WALL REMOVED AND DISPOSED AT _____ PER FOOT		
690.12	160	FLAGSTONE LANDSCAPE WALL REMOVED AND REBUILT AT _____ PER SQUARE FOOT		
690.13	20	FLAGSTONE LANDSCAPE WALL REMOVED AND STACKED AT _____ PER FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
691.01	30	HISTORIC MORTARED STONE RETAINING WALLS REMOVED AND RESET AT _____ PER FOOT		
691.2	180	HISTORIC STONE BALANCE WALLS REMOVED AND RESET AT _____ PER FOOT		
697.1	200	SILT SACK AT _____ EACH		
698.3	330	GEOTEXTILE FABRIC FOR SEPARATION AT _____ PER SQUARE YARD		
701.	2,640	CEMENT CONCRETE SIDEWALK AT _____ PER SQUARE YARD		
701.1	2,150	CEMENT CONCRETE SIDEWALK AT DRIVEWAYS AT _____ PER SQUARE YARD		
701.2	650	CEMENT CONCRETE PEDESTRIAN CURB RAMP AT _____ PER SQUARE YARD		
701.3	1	MODIFICATIONS TO CONCRETE WALK AND RAILINGS AT _____ LUMP SUM		
702.	2,340	HOT MIX ASPHALT SIDEWALK OR DRIVEWAY AT _____ PER TON		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
706.11	5	BRICK WALK REMOVED AND STACKED AT _____ PER SQUARE YARD		
706.4	1	GRANITE STEPS REMOVED AND RESET AT _____ LUMP SUM		
706.5	5	FIELD STONE WALK REMOVED AND RESET AT _____ PER SQUARE YARD		
711.	2	BOUND REMOVED AND RESET AT _____ EACH		
714.01	1	MONUMENT REMOVED AND RESET #1 AT _____ LUMP SUM		
714.02	1	MONUMENT REMOVED AND RESET #2 AT _____ LUMP SUM		
715.	25	RURAL MAIL BOX REMOVED AND RESET AT _____ EACH		
715.53	5	REMOVE AND STACK LANDSCAPE BOULDERS AT _____ EACH		
715.54	34	REMOVE AND RESET LANDSCAPE BOULDERS AT _____ EACH		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
722.2	1	SCHEDULE OF OPERATIONS (TYPE B) - FIXED PRICE $95,000 AT Ninety Five Thousand Dollars LUMP SUM	$95,000.00	$95,000.00
740.	44	ENGINEER'S FIELD OFFICE AND EQUIPMENT (TYPE A) AT _____ PER MONTH		
748.	1	MOBILIZATION AT _____ LUMP SUM		
751.	1,500	LOAM BORROW AT _____ PER CUBIC YARD		
751.1	1,380	LOAM FOR LAWNS AT _____ PER CUBIC YARD		
751.7	320	COMPOST BLANKET AT _____ PER CUBIC YARD		
756.	1	NPDES STORMWATER POLLUTION PREVENTION PLAN AT _____ LUMP SUM		
765.	29,155	SEEDING AT _____ PER SQUARE YARD		
765.21	20	ANNUAL COVER CROP FOR NATIVE SEEDING AT _____ PER POUND		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
765.554	10	WETLAND MIX - SEASONALLY FLOODED AT _____ PER POUND		
765.635	2,860	NATIVE SEEDING AND ESTABLISHMENT AT _____ PER SQUARE YARD		
767.121	3,400	SEDIMENT CONTROL BARRIER AT _____ PER FOOT		
767.31	29,155	STRAW MULCH AT _____ PER SQUARE YARD		
769.	8,000	PAVEMENT MILLING MULCH UNDER GUARD RAIL AT _____ PER FOOT		
777.538	2	PLANETREE - LONDON 8-10 FEET / #15 AT _____ EACH		
782.533	2	REDBUD - EASTERN 4-5 FEET AT _____ EACH		
804.3	2,520	3 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC -(UL) AT _____ PER FOOT		
811.22	8	ELECTRIC HANDHOLE - SD2.022 AT _____ EACH		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
811.31	31	PULL BOX 12 X 12 INCHES - SD2.031 AT _____ EACH		
813.811	2	ELECTRIC SERVICE RISER RELOCATION AT _____ EACH		
815.1	1	TRAFFIC CONTROL SIGNAL LOCATION NO. 1 AT _____ LUMP SUM		
815.2	1	TRAFFIC CONTROL SIGNAL LOCATION NO. 2 AT _____ LUMP SUM		
816.03	1	TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO. 3 AT _____ LUMP SUM		
823.71	7	HIGHWAY LIGHTING POLE AND LUMINAIRE REMOVED AND STACKED AT _____ EACH		
823.72	10	PRIVATE LIGHT POLE AND LUMINAIRE REMOVED AND STACKED AT _____ EACH		
825.2	2	RRFB (2-POST ASSEMBLY SYSTEM) AT _____ EACH		
831.11	120	ROADSIDE GUIDE SIGN (MA-D1-XX) - ALUMINUM PANEL (TYPE A) AT _____ PER SQUARE FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
832.	730	WARNING-REGULATORY AND ROUTE MARKER - ALUMINUM PANEL (TYPE A) AT _____ PER SQUARE FOOT		
841.11	3	SUPPORTS FOR GUIDE SIGN (MA-D1-XX) 5 INCH TUBULAR STEEL AT _____ EACH		
847.1	110	SIGN SUP (N/GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY - STEEL AT _____ EACH		
848.1	20	SIGN SUP (N/GUIDE)+RTE MKR W/2 BRKWAY POST ASSEMBLIES-STEEL AT _____ EACH		
850.41	500	ROADWAY FLAGGER AT _____ PER HOUR		
851.1	850	TRAFFIC CONES FOR TRAFFIC MANAGEMENT AT _____ PER DAY		
852.	1,000	SAFETY SIGNING FOR TRAFFIC MANAGEMENT AT _____ PER SQUARE FOOT		
852.11	500	TEMPORARY PEDESTRIAN BARRICADE AT _____ PER FOOT		
852.12	10	TEMPORARY PEDESTRIAN CURB RAMP AT _____ EACH		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
853.1	6	PORTABLE BREAKAWAY BARRICADE TYPE III AT _____ EACH		
853.21	800	TEMPORARY BARRIER REMOVED AND RESET AT _____ PER FOOT		
853.33	1,400	TEMPORARY BARRIER - LIMITED DEFLECTION (TL-3) AT _____ PER FOOT		
853.403	10	TRUCK MOUNTED ATTENUATOR AT _____ PER DAY		
853.8	30	TEMPORARY ILLUMINATION FOR WORK ZONE AT _____ PER DAY		
854.016	38,100	TEMPORARY PAVING MARKINGS - 6 INCH (PAINTED) AT _____ PER FOOT		
854.036	17,000	TEMPORARY PAVING MARKINGS - 6 INCH (TAPE) AT _____ PER FOOT		
854.1	800	PAVEMENT MARKING REMOVAL AT _____ PER SQUARE FOOT		
856.	3,360	ARROW BOARD AT _____ PER DAY		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
856.12	1,680	PORTABLE CHANGEABLE MESSAGE SIGN AT _____ PER DAY		
859.	94,500	REFLECTORIZED DRUM AT _____ PER DAY		
864.04	880	PAVEMENT ARROWS AND LEGENDS REFLECTORIZED WHITE (THERMOPLASTIC) AT _____ PER SQUARE FOOT		
864.31	50	SLOTTED PAVEMENT MARKER ONE-WAY WHITE AT _____ EACH		
864.32	160	SLOTTED PAVEMENT MARKER ONE-WAY YELLOW AT _____ EACH		
864.35	230	SLOTTED PAVEMENT MARKER TWO-WAY YELLOW/YELLOW AT _____ EACH		
866.206	22,400	6 INCH REFLECTORIZED WHITE LINE (POLYUREA) (RECESSED) AT _____ PER FOOT		
866.212	4,400	12 INCH REFLECTORIZED WHITE LINE (POLYUREA) (RECESSED) AT _____ PER FOOT		
867.206	20,000	6 INCH REFLECTORIZED YELLOW LINE (POLYUREA) (RECESSED) AT _____ PER FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
867.212	1,100	12 INCH REFLECTORIZED YELLOW LINE (POLYUREA) (RECESSED) AT _____ PER FOOT		
874.	40	STREET NAME SIGN AT _____ EACH		
874.2	11	TRAFFIC SIGN REMOVED AND RESET AT _____ EACH		
874.41	91	TRAFFIC SIGN REMOVED AND DISCARDED AT _____ EACH		
874.71	1	BUSINESS SIGN RMEOVED AND STACKED AT _____ LUMP SUM		
903.	10	3000 PSI, 1.5 INCH, 470 CEMENT CONCRETE AT _____ PER CUBIC YARD		
904.3	110	5000 PSI, 3/4 INCH, 685 HP CEMENT CONCRETE AT _____ PER CUBIC YARD		
910.1	5,200	STEEL REINFORCEMENT FOR STRUCTURES - EPOXY COATED AT _____ PER POUND		
912.1	90	DRILLING AND GROUTING DOWELS AT _____ PER FOOT		

Project # 608491	Contract # 131468			
Location : MENDON				
Description : Resurfacing and Related Work on Route 16				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
950.1	1	TEMPORARY SHORING AT _____ LUMP SUM		
970.	8,100	DAMP-PROOFING AT _____ PER SQUARE FOOT		
986.	660	MODIFIED ROCKFILL AT _____ PER TON		
991.1	1	CONTROL OF WATER - STRUCTURE NO. 001 AT _____ LUMP SUM		
992.33	10	COORDINATION OF TEMPORARY SUPPORT FOR UTILITY POLES AT _____ EACH		
Total Qty:	654,842			

DOCUMENT B00853

SCHEDULE OF PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES (DBES)

PRIME BIDDER: _____

DATE OF BID OPENING: _____ PROJECT NO.: 608491

FEDERAL AID PROJECT NO. NHP(NHS)-003S(866)X

PROJECT LOCATION: MENDON

Name, Address, and Phone Number(s) of DBE	Name of Activity	(a)† DBE Contractor Activity Amount *Construction Work*	(b) DBE Other Business Amount *Services, Supplies, Material*	(c) Total amount eligible for credit under rules in Section 6 of Document 00719 - DBE Special Provisions
Total Bid Amount	TOTALS:	$	$	$
$	DBE Percentage of Total Bid:	%	%	%

†*Column (a) must be at least one-half of the DBE participation goal. Attach additional sheets as necessary.*

Is MassDOT Document B00855 (Joint Check Approval) being submitted for any of the above? ☐ Yes ☐ No ☐ Not Known at This Time

Will any of the contractors listed above be using a third party (i.e. manufacturer) to deliver materials or perform any portion of work by a third party? ☐ Yes ☐ No

CERTIFICATION: I HEREBY DECLARE, TO THE BEST OF MY KNOWLEDGE, THAT **I HAVE READ THE SPECIAL PROVISIONS FOR PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES - DOCUMENT 00719.** BOTH THIS SCHEDULE AND THE RELEVANT AND ACCOMPANYING LETTER(S) OF INTENT ARE IN FULL COMPLIANCE WITH THE PROVISIONS OF, AND IN ACCORDANCE WITH, TITLE 49 CODE OF FEDERAL REGULATIONS, PART 26 (49 CFR Part 26).

SIGNATURE:_____ DATE_____

NAME AND TITLE (*PRINT*):_____

EMAIL ADDRESS: _____TEL NO.:_____

*** END OF DOCUMENT ***

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DOCUMENT B00854

DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION
LETTER OF INTENT
(To be completed by the DBE – Page 1 of 2)

TO: _____ (Prime Bidder)

FROM: _____ (DBE Firm)

RE: PROJECT NO.: 608491 FEDERAL AID PROJECT NO.: NHP(NHS)-003S(866)X

PROJECT LOCATION: MENDON

DATE OF BID OPENING: _____

I, _____, authorized signatory of the above-referenced DBE firm hereby declare:
Print Name

1. My company is currently certified as a Disadvantaged Business Enterprise (DBE) by the Massachusetts Supplier Diversity Office ("SDO"), formerly known as the State Office of Minority and Women Business Assistance (SOMWBA), as a: (check all applicable, see Section 1 of the Special Provisions For Participation By Disadvantaged Business Enterprises, MassDOT Document 00719 additional guidance is available at Title 49, Code of Federal Regulations, Part 26.55 (49 CFR Part 26.55)):

   ( ) CONTRACTOR ( ) REGULAR DEALER ( ) BROKER
   ( ) MANUFACTURER ( ) TRUCKING OPERATIONS ( ) PROFESSIONAL SERVICES

2. My firm has the ability to manage, supervise and perform the activity described on page 2 of this Letter of Intent. If you are awarded the contract, my company intends to enter into a contract with your firm to perform the items of work or other activity described on the following sheet for the prices indicated.

3. There have been no changes affecting the ownership, control or independence of my company since my last certification review on _____ ___, 20___. If any such change is planned or occurs prior to my company's completion of this proposed work, I will give prior written notification to your firm and to the Massachusetts Department of Transportation ("MassDOT") Office of Civil Rights and SDO.

4. I have read the MassDOT proposal for the Project which may be entitled "Project Contract Documents and Special Provisions" or the draft "Contract" which includes MassDOT Document 00719, and acknowledge that my company will comply with that document and the requirements of 49 CFR Part 26.

5. For the purpose of obtaining subcontractor approval from MassDOT, my firm will provide to you:

   A. ***The following construction work:***
      (i) a resume, stating the qualifications and experience, of the superintendent or foreperson who will supervise on site-work;
      (ii) a list of equipment owned or leased by my firm for use on this project; and
      (iii) a list of all projects (public or private) upon which my firm is currently performing, is committed to perform, or intends to make a commitment to perform. I shall also include, for each project: the name and telephone number of a contact person for the contracting authority, person, or organization; the dollar value of the work; a description of the work; and my firm's work schedule for the project.

   B. ***The following services, materials or supplies***:
      (i) a written agreement and invoices for the materials or supplies, and any other documents evidencing the terms of providing such items;
      (ii) information concerning brokers fees and commissions for providing services or materials; and
      (iii) a statement concerning whether my firm intends or will be required to use a joint check arrangement; and any other documents that may be required by MassDOT.

_____ Date_____
DBE Company Authorized Signature

DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION
LETTER OF INTENT
(To be completed by the DBE – Page 2 of 2)

DATE OF BID OPENING: _____

PROJECT NUMBER: 608491

FEDERAL AID PROJECT NUMBER: NHP(NHS)-003S(866)X

PROJECT LOCATION: MENDON

PRIME BIDDER: _____

DBE COMPANY NAME: _____

Item number if applicable	NAICS Code	Description of Activity with notations such as Services, or Brokerage, Installation Only, Material Only, or Complete	Quantity	Unit Price	Amount
			TOTAL AMOUNT:		

Please give full explanations, attach additional sheets if necessary.

I HEREBY VERIFY THAT _____ WILL SOLELY
(DBE company name)
PERFORM THE WORK, OR PROVIDE THE SERVICES OR MATERIALS, AS DESCRIBED ABOVE.

DBE AUTHORIZED SIGNATURE: _____

NAME AND TITLE (PRINT):_____

TELEPHONE NUMBER: _____FAX NUMBER: _____

EMAIL ADDRESS: _____

Rev'd 9/20/19

*** END OF DOCUMENT ***

DOCUMENT B00855

DBE JOINT CHECK ARRANGEMENT APPROVAL FORM

(to be submitted by Prime Contractor)

Contract No: 131468 **Project No.** 608491 **Federal Aid No.** NHP(NHS)-

Location: MENDON **Bid Opening Date:** _____

Project Description: Resurfacing and Related Work on Route 16

We have received the attached request for the use of a joint check arrangement from _____ _____ , a DBE on the above- referenced Contract and _____ _____, a Material Supplier/Vendor for the subject Contract. The DBE has complied with the requirements of 49 CFR Part 26.55(c)(1). In particular, the DBE has:

- a written agreement with the material supplier/vendor;
- applied for credit with the subject material supplier and has supplied the vendor's response;
- shown that it will place all orders to the subject material supplier/vendor;
- made and retains all decision-making responsibilities concerning the materials; and
- provided a Joint Check Agreement that is acceptable to MassDOT;

As the Contractor for the Project, we agree to issue joint checks (made payable to the Material Supplier/Vendor and the DBE) for payment of sums due pursuant to invoices from the Supplier/Vendor and DBE.

Contractor:

_____ _____
Company Name Signature
Duly Authorized

_____
Printed Name

_____ _____
Date Title

SubContractor:

_____ _____
Company Name Signature –
Duly Authorized

_____
Printed Name

_____ _____
Date Title

*** END OF DOCUMENT ***

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DOCUMENT B00856

JOINT VENTURE AFFIDAVIT

(All Firms)

- All Information Requested By This Schedule Must Be Answered. Additional Sheets May Be Attached.
- If, there is any change in the information submitted, the Joint Venture parties must inform MassDOT Pre-Qualifications Office (and, if one of the companies is a DBE, the Director of Contract Compliance, Office of Civil Rights) *prior* to such change, in writing, either directly or through the Prime Contractor if the Joint Venture is a subcontractor.
- If the Joint Venture Entity will be the bidder on a prime Contract, it must bid and submit all required documents (insurance, worker's compensation, bonds, etc.) in the name of the Joint Venture Entity.

I. Name of Joint Venture: _____

Type of Entity if applicable (Corp., LLC):_____Filing State _____

Address of joint venture: _____

_____

Phone No(s) for JV Entity: _____E-mail:_____

Contact Person(s)_____

Tax ID/EIN of Joint Venture: _____Vendor Code:_____

II. Identify each firm or party to the Joint Venture:

Name of Firm: _____

Address: _____

Phone : _____E-mail:_____

Contact person(s) _____

Name of Firm: _____

Address: _____

Phone: _____E-mail:_____

Contact Person(s)_____

III. Describe the role(s) of the each party to the Joint Venture:

_____

_____

IV. Attach a copy of the Joint Venture Agreement. The proposed Joint Venture Agreement should include specific details including, but not limited to: (1) the contributions of capital and equipment; (2) work items to be performed by each company's forces, (3) work items to be performed under the supervision of any DBE Venturer; (4) the commitment of management, supervisory and operative personnel employed by the DBE to be dedicated to the performance of the Project; and (5) warranty, guaranty, and indemnification clauses.

V. Attach any applicable Corporate or LLC Votes, Authorizations, etc.

VI. Ownership of the Joint Venture:

A. What is the percentage(s) of each company's ownership in the Joint Venture?

ownership percentage(s): _____

ownership percentage(s): _____

B. Specify percentages for each of the following (provide narrative descriptions and other detail as applicable):

1. Sharing of profit and loss: _____
2. Capital contributions:

(a) Dollar amounts of initial contribution: _____

(b) Dollar amounts of anticipated on-going contributions: _____

(c) Contributions of equipment (specify types, quality and quantities of equipment to be provided by each firm): _____

_____

4. Other applicable ownership interests, including ownership options or other agreements, which restrict or limit ownership and/or control:

_____

_____

5. Provide copies of all other written agreements between firms concerning bidding and operation of this Project or projects or contracts.

6. Identify all current contracts and contracts completed during the past two (2) years by either of the Joint Venture partners to this Joint Venture:

_____

_____

VII. Control of and Participation in the Joint Venture. Identify by name and firm those individuals who are, or will be, responsible for and have the authority to engage in the following management functions and policy decisions. (Indicate any limitations to their authority such as dollar limits and co-signatory requirements.):

A. Joint Venture check signing:

_____

_____

B. Authority to enter Contracts on behalf of the Joint Venture:

_____

_____

C. Signing, co-signing and/or collateralizing loans:

_____

_____

D. Acquisition of lines of credit:

E. Acquisition and indemnification of payment and performance bonds:

F. Negotiating and signing labor agreements:

G. Management of contract performance. *(Identify by name and firm only)*:

1. Supervision of field operations:
2. Major purchases:
3. Estimating:
4. Engineering:

VIII. Financial Controls of Joint Venture:

A. Which firm and/or individual will be responsible for keeping the books of account?

B. Identify the "Managing Partner," if any, and describe the means and measure of their compensation:

C. What authority does each firm have to commit or obligate the other to insurance and bonding companies, financing institutions, suppliers, subcontractors, and/or other parties participating in the performance of this Contract or the work of this Project?

IX. Personnel of Joint Venture: State the approximate number of personnel (by trade) needed to perform the Joint Venture's work under this Contract. Indicate whether they will be employees of the majority firm, DBE firm, or the Joint Venture.

	Firm 1 (number)	Firm 2 (number)	Joint Venture (number)
Trade			
Professional			
Administrative/Clerical			
Unskilled Labor			

Will any personnel proposed for this Project be employees of the Joint Venture?: _____

If so, who: _____

A. Are any proposed Joint Venture employees currently employed by either firm?

Employed by Firm 1: _____ Employed by firm 2 _____

B. Identify by name and firm the individual who will be responsible for Joint Venture hiring: ____

_____

X. Additional Information. Please state any material facts and additional information pertinent to the control and structure of this Joint Venture.

_____

_____

XI. AFFIDAVIT OF JOINT VENTURE PARTIES. The undersigned affirm that the foregoing statements and attached documents are correct and include all material information necessary to identify and explain the terms and operations of our Joint Venture and the intended participation of each firm in the undertaking. Further, the undersigned covenant and agree to provide to MassDOT current, complete and accurate information regarding actual Joint Venture work, payments, and any proposed changes to any provisions of the Joint Venture, or the nature, character of each party to the Joint Venture. We understand that any material misrepresentation will be grounds for terminating any Contract awarded and for initiating action under Federal or State laws concerning false statements.

Firm 1	Firm 2
Signature Duly Authorized	Signature Duly Authorized
Printed Name and Title	Printed Name and Title
Date	Date

*** END OF DOCUMENT ***